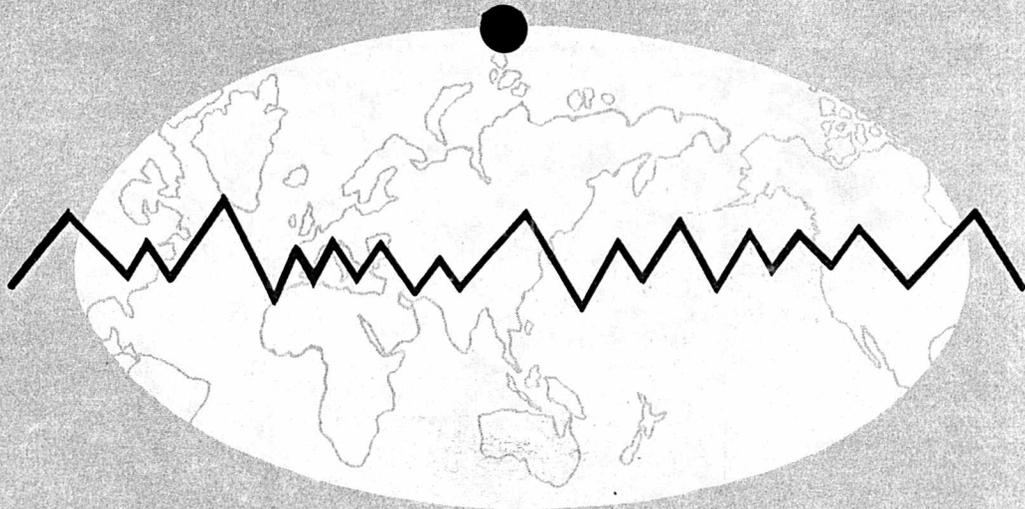


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# ASIAN INFLUENZA

1957-1960



U. S. DEPARTMENT OF

HEALTH, EDUCATION, and WELFARE

PUBLIC HEALTH SERVICE

*The Epidemiology of Asian Influenza*

1957 — 1960

*A Descriptive Brochure*

Epidemiology Branch  
Communicable Disease Center  
Atlanta, Georgia  
July 1960

CDC INFORMATION CENTER  
CENTERS FOR DISEASE CONTROL  
ATLANTA, GEORGIA 30333

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## FOREWORD

This brochure is a compilation of charts and graphs, prepared originally for the International Conference on Asian Influenza, held at the National Institutes of Health, Bethesda, Maryland, February 17-19, 1960. Following this conference, it was decided to revise this brochure for publication as an Appendix to the Proceedings of the International Conference on Asian Influenza, as well as in booklet form for distribution to interested individuals and for use as a teaching aid.

No attempt is made to provide an exhaustive review of the accumulated literature on the epidemiologic and mortality characteristics of Asian influenza from 1957 to 1960; it is intended rather to present graphically the pertinent and generally accepted facts relating to the introduction and spread of the new strain of influenza virus, and to highlight the morbidity and mortality it caused. In many instances these characteristics of the 1957-60 epidemics are compared to similar known characteristics of previous national or world-wide outbreaks of influenza.

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## Figure 1. PROGRESS OF ASIAN INFLUENZA

It is unlikely that the point of origin of the new strain, A<sub>2</sub>, or Asian influenza virus will ever be precisely located. The first reported outbreak of the disease was in late February, 1957, in Kweichow Province, near Kweiyang, deep in the Chinese mainland. In early March, Yunan Province was affected, and by the middle of the month the disease was occurring in many parts of China.

In early April, epidemic influenza appeared in Hong Kong, probably introduced via refugees from the Chinese mainland. Almost concurrently, an outbreak occurred in Singapore, probably introduced by ships. These two outbreaks, identified a month later as being due to a variant type A influenza virus, served to call international attention to the possibility of rapid world-wide involvement.

From Hong Kong and Singapore, both major shipping centers, the disease spread rapidly to Taiwan, Borneo, Japan, the Philippines, and thence throughout most of the Orient. In May, localized outbreaks were reported in Australia, India, Malaya, and Indonesia. In June the remaining countries of Asia were involved, and a well-defined westward spread across the Middle East was noted, reaching the east coast of Africa by the end of the month. At this time, localized outbreaks also began to occur in several countries of Europe, Rumania, Czechoslovakia, and particularly the Netherlands, probably introduced from Indonesia by ship and aircraft. Outbreaks were not uncommon on ships bound for Eng-

### REFERENCES

- Dunn, F. L.: *Pandemic Influenza in 1957; Review of International Spread of New Asian Strain*, J.A.M.A., 166:1140-1148, 1958.  
*Foreign Epidemiological Summaries*, Washington, D. C., United States Public Health Service, 1957.  
*Influenza Reports*, Washington, D. C., International Cooperation Administration, 1957.

## PANDEMIC - FEBRUARY 1957 TO JANUARY 1958

land, Hawaii, and the United States, and localized concentrations of cases occurred in the continental United States and Alaska.

In July, the disease, while continuing to spread in epidemic form in the Middle East and in Africa, reached South and Central America; epidemics were reported in Ecuador, Bolivia, Chile, Columbia, Panama, and Mexico. In Europe, the disease continued to appear in localized outbreaks throughout the Netherlands, and broke out in similar form in England and Southern Italy. Greenland, New Zealand, and Newfoundland, among others, also reported outbreaks during this month.

In August, while the disease subsided in Asia, a widespread epidemic occurred in Australia. Epidemics were also reported from the remaining countries of Africa, Central and South America. Scattered outbreaks continued to occur throughout Europe, and Italy experienced a widespread epidemic.

In September, influenza declined in the Middle East, but widespread epidemics occurred in Europe and began in North America. In October the epidemics in Europe and North America reached their peaks, the Scandinavian countries being the last to be affected. Meanwhile, influenza was declining in Central and South America, as well as Africa. Japan, however, experienced a severe second wave during this month.

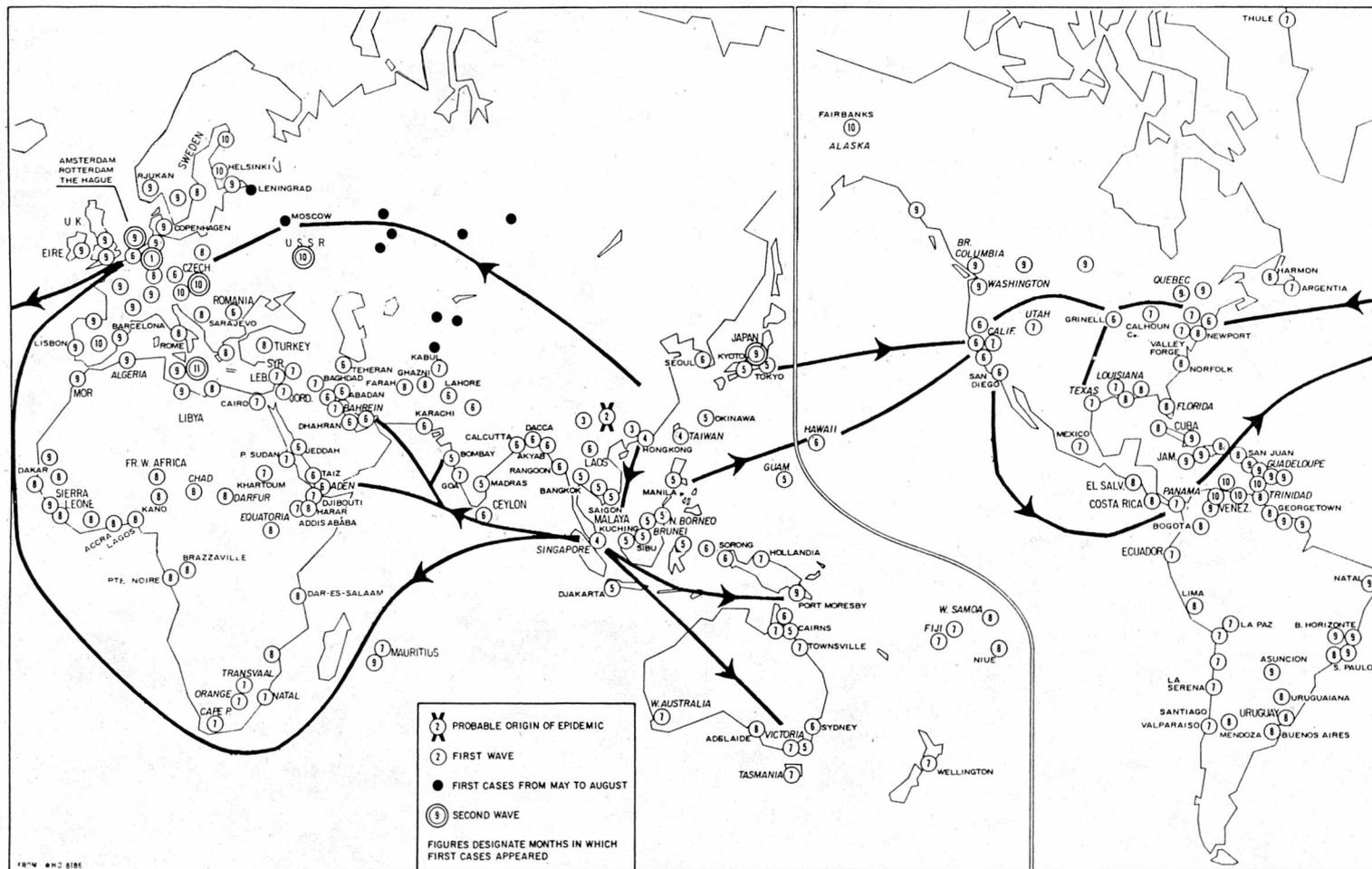
In November, influenza was subsiding everywhere, and by early December had essentially completed its course around the world.

*Morbidity and Mortality Reports*, Washington, D. C., National Office of Vital Statistics, Public Health Service, U. S. Department of Health, Education, and Welfare, 1957.

Payne, A. M.-M: *Influenza Epidemic Memos*, Section of Endemic-Epidemic Disease, World Health Organization, Geneva, 1957.

*Weekly Epidemiological Records*, World Health Organization, Geneva, 1957.

Figure 1. PROGRESS OF ASIAN INFLUENZA PANDEMIC  
 FEBRUARY 1957 TO JANUARY 1958



## Figure 2. STATUS OF ASIAN INFLUENZA IN THE THROUGH JULY 22, 1957

The initial recognized cases and outbreaks of Asian influenza in the United States occurred among military personnel. Numerous cases had been diagnosed aboard ships bound for the United States, especially the West Coast. The first outbreak to be recognized in the United States, however, occurred on June 2, 1957, at Newport, Rhode Island, among military personnel aboard destroyers taking part in naval exercises. Shortly thereafter, a series of outbreaks was reported from California, without known connection to Newport; approximately 10,000 cases occurred on military reservations on the West Coast.

The first recognized civilian outbreak began at a teen-age girls' conference at Davis, California, beginning June 20. During the following several weeks, more than 15 similar outbreaks were reported in childrens' camps in California. Secondary and sporadic cases continued to occur in California during the remaining summer months.

Many examples of spread and resultant seeding of A<sub>2</sub> influenza virus across United States were recognized. In late June a conference was held in Grinnell, Iowa, involving 1,800 young persons from 43 States and several foreign countries. Several of those attending had been in contact with Asian influenza in California, and over 200 cases of influenza occurred among the participants. About 50 further cases were detected among the conferees after they had returned to their homes.

Many other small outbreaks were reported across the country by early July. Plans to hold the International Boy Scout Jamboree, at Valley Forge, Pennsylvania, from July 10-24, were not interrupted, since although

### REFERENCES

- Dunn, F. L., Carey, D. E., Cohen, A., and Martin, J. D.: *Epidemiologic Studies of Asian Influenza in a Louisiana Parish*, Am. J. Hyg., 70:351-371, 1959.
- Langmuir, A. D., Pizzi, M., Trotter, W. Y., and Dunn, F. L.: *Asian*

## UNITED STATES AND MAJOR ROUTES OF SPREAD -

more than 53,000 boys from all parts of the world as well as the United States were expected to attend, the actual degree of personal contact to be anticipated was felt to be quite low. Although sporadic cases did occur during the encampment, no epidemic materialized. Several sharp outbreaks did occur, however, among groups in crowded buses and railway coaches en route to and from the Jamboree.

Thus it became apparent that epidemics were likely to occur during the summer months only in closely associated groups. On August 12, the AROSA SKY docked in New York with at least 50 active cases of influenza among some 400 foreign exchange students who had traveled tourist class. Only 2 cases had occurred among the 400 crewmen and first class passengers. An unbroken epidemiologic thread of continuity, involving several generations of disease, could be traced from these cases to Istanbul, Turkey, where influenza was known to be active at that time.

The first dynamic spread of Asian strain influenza throughout a community occurred in Tangipahoa Parish, Louisiana. There, in August, epidemics developed among school children, industries, and spread widely throughout the community. This was particularly significant, for in this parish, schools opened in July because of the agricultural need for children to assist in gathering the strawberry crop in the spring.

During the remainder of the summer, A<sub>2</sub> influenza virus was seeded throughout the United States, via routes similar to those described. It remained for colder weather, school openings, closer crowding, and similar factors to catalyze the resultant nation-wide epidemic during the autumn months.

*Influenza Surveillance*, Pub. Health Rep., 73:114-120, 1958.

Trotter, Y., Jr., Dunn, F. L., Drachman, R. H., Henderson, D. A., Pizzi, M., and Langmuir, A. D.: *Asian Influenza in the United States, 1957-1958*, Am. J. Hyg., 70:24-50, 1959.

Figure 2. STATUS OF ASIAN INFLUENZA IN THE UNITED STATES  
AND MAJOR ROUTES OF SPREAD - THROUGH JULY 22, 1957

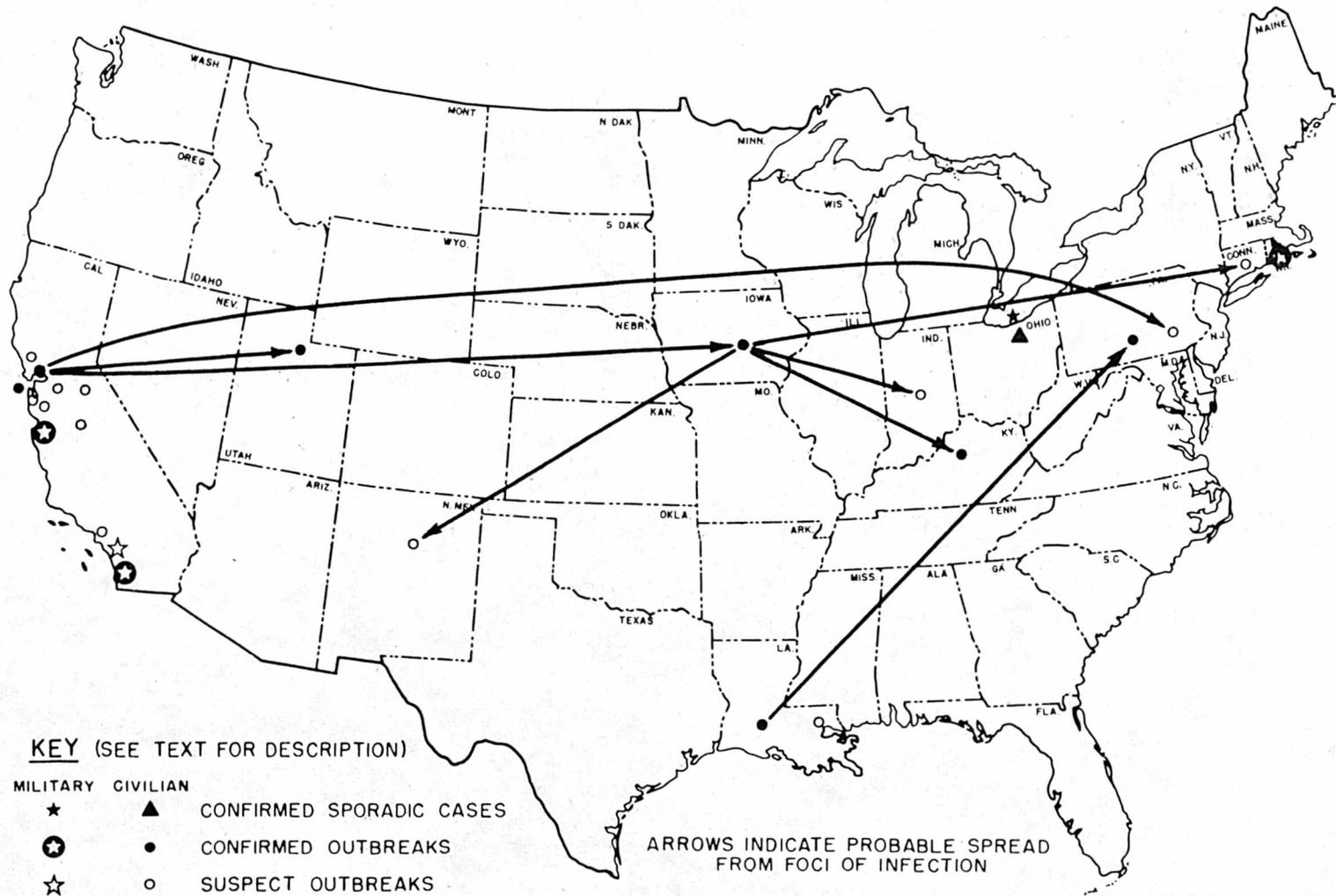


Figure 3. GEOGRAPHIC SPREAD OF ASIAN INFLUENZA BY COUNTY --  
THROUGH DECEMBER 16, 1957

Each dot on the map represents a county in which outbreaks of clinical influenza, or sporadic cases of confirmed Asian influenza had occurred. No attempt is made to portray the extent of the disease within counties. The map is cumulative as of December 16, 1957, a date by which the first wave had almost completely subsided.

Sources of information used to construct this map were many and varied. Reports were utilized from State Health Officers, Epidemic Intelligence Service Officers, the National Office of Vital Statistics, and the influenza diagnostic laboratories collaborating with the WHO International Influenza Center for the Americas. In addition, newspaper accounts of the occurrence of sharp outbreaks in specific counties provided a valuable source of information.

As of December 16, 1957, at least 1,758 counties, or 57 percent of the 3,068 United States counties had experienced influenza outbreaks, or had confirmed Asian strain cases. Certainly this total must be regarded as incomplete.

REFERENCES

Trotter, Y., Jr., Dunn, F. L., Drachman, R. H., Henderson, D. A., Pizzi, M., and Langmuir, A. D.: *Asian Influenza in the United States, 1957-1958*, Am. J. Hyg., 70:24-50, 1959.

Figure 3. GEOGRAPHIC SPREAD OF ASIAN INFLUENZA BY COUNTY  
THROUGH DECEMBER 16, 1957

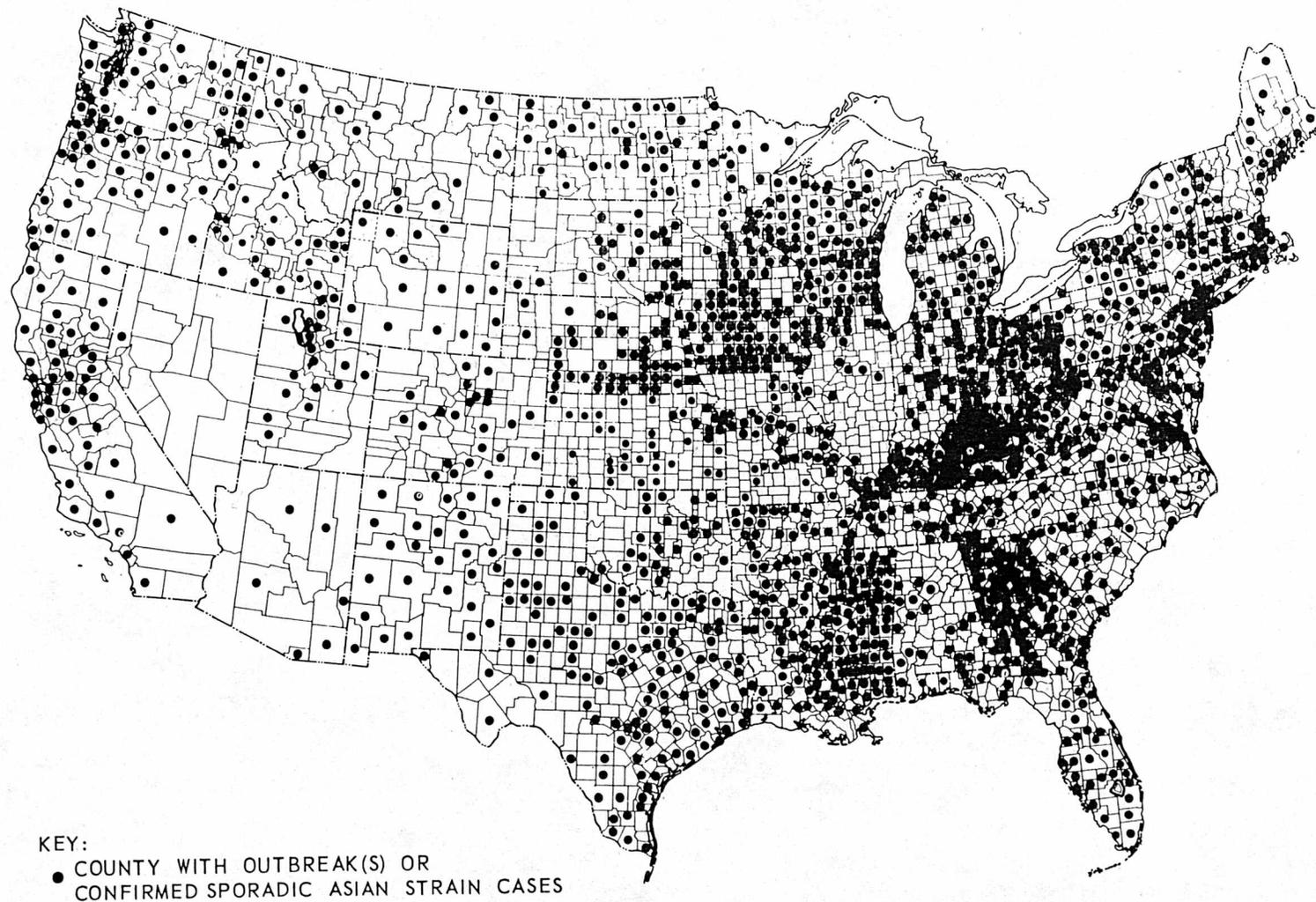


Figure 4. PERCENTAGE OF COUNTIES REPORTING INFLUENZA  
OUTBREAKS – JULY THROUGH OCTOBER 1957

This figure illustrates the geographic pattern of progression of epidemic influenza by States, as constructed from the data obtained from reports of a total of 1,927 counties. States are measured in terms of percent of total reported counties. Few States achieved 100 percent county reporting.

“As shown in the maps, the West Coast was involved first, followed shortly by Louisiana and Mississippi, which experienced extensive epidemics involving large areas. Then in early September, the highly populated areas of the East were hit in rapid succession. New York City was one of the first large cities with an epidemic. At approximately the same time, New Mexico, Utah, and Arizona suffered explosive school and community outbreaks. During October the epidemic seemed to progress toward the central and northern areas of the country, although the southeastern States were involved relatively late. The last geographic areas to be extensively involved were the Dakotas.”

REFERENCES

- Trotter, Y., Jr., Dunn, F. L., Drachman, R. H., Henderson, D. A., Pizzi, M., and Langmuir, A. D.: *Asian Influenza in the United States, 1957-1958*, Am. J. Hyg., 70:34-50, 1959.

Figure 4 PERCENTAGE OF COUNTIES REPORTING INFLUENZA OUTBREAKS  
JULY THROUGH OCTOBER 1957

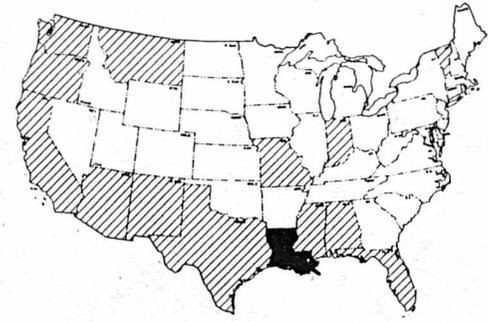
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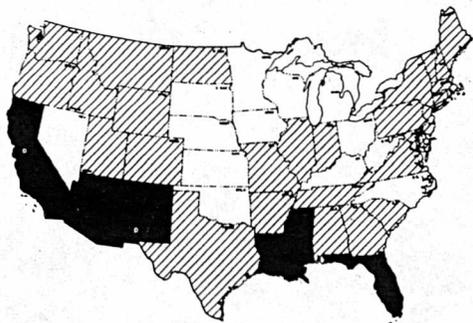
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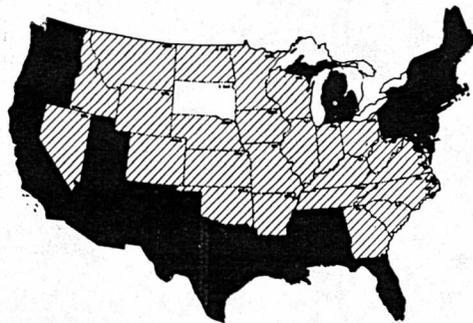
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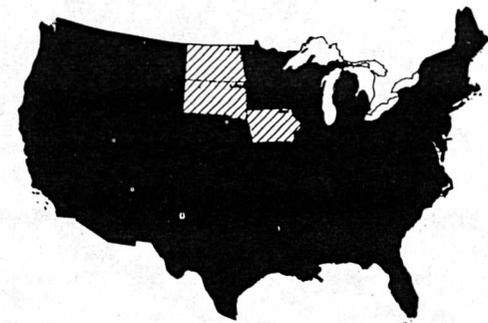
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OCTOBER 12



OCTOBER 26

Figure 5. WEEKLY INCIDENCE OF RESPIRATORY ILLNESSES BY AGE GROUPS – JULY 1957-JUNE 1959, RATES PER 100,000 POPULATION

These data, made available through the National Health Survey, show quite conclusively that children under 15 years of age had higher incidence rates of new cases of respiratory disease involving one or more bed-days of illness throughout the year relative to other age groups. Unfortunately, these data are not subdivided by the significant pre-school, grammar school, and high school age groups.

During the months of the Asian influenza epidemic, September, October, and November 1957, rates were highest in the childhood group, followed by the incidence rate in the 15- to 44-year group. Succeedingly lower rates were observed in the older age groups: 45-64 and 65-and-over. During the "second wave" of the epidemic (January, February, March 1958), the rates in the under-15 and 15-44 year age group were only half as high as during the first wave. In the 45- to 64-year group, the relative decline was not as great. In the 65-and-over age group, the incidence rate of new episodes of respiratory ailments was essentially equal during both "waves."

In 1958-1959, following a summer low, the incidence rates of all age groups, except the very old, reflect the rise and wane of respiratory disease during the fall and winter months of that year, culminating in a maximum in the spring. The older age group, however, experienced its highest incidence rate in the early winter months.

Figure 5 WEEKLY INCIDENCE OF RESPIRATORY ILLNESSES  
 BY AGE GROUPS  
 July 1957 - June 1959

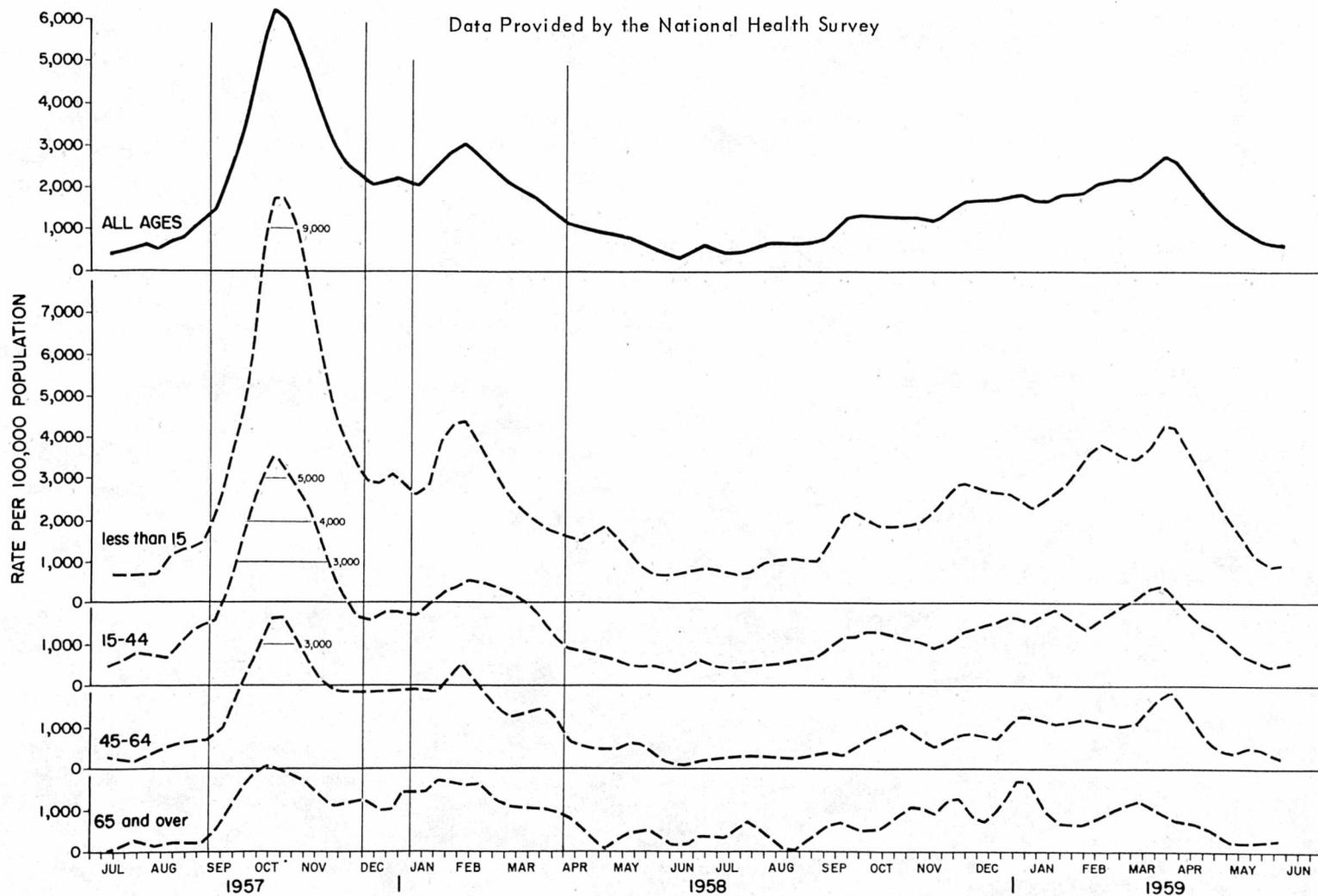


Figure 6. INFLUENZA ATTACK RATES BY AGE, THREE SCHOOL SURVEYS, TANGIPAHOA PARISH, LOUISIANA

An extensive epidemiologic study was undertaken of the influenza epidemic in Tangipahoa Parish, Louisiana. This epidemic occurred in late July and early August, shortly after the schools opened, and represented the first recognized instance of a dynamic, community-wide epidemic.

Of particular interest was a series of school surveys done in the Parish. After the school epidemics had subsided, each high school student was requested to complete a questionnaire regarding the occurrence of "flu" among all members of his family. Age-specific attack rates were then calculated from the tabulated questionnaires for each of the three schools thus surveyed.

Dillon and West Side Schools both had lower class Negro students; Independence School students consisted of lower and middle class Whites.

Totals and overall attack rates were as follows:

<u>School</u>	<u>No. Ill</u>	<u>Total Individuals</u>	<u>Cases per 100 Persons</u>
Dillon	313	619	50.6
West Side	634	1,343	47.2
Independence	374	1,125	33.2

Age-specific rates among pre-school children were relatively low, 33 to 46 percent. They rose sharply to a peak, however, in the 10- to 14-year age group, 47 to 68 percent. They remained high in the 15- to 24-year age group, 44 to 63 percent, and then dropped abruptly among older age groups.

#### REFERENCES

- Dunn, F. L., Carey, D. E., Cohen, A., and Martin, J. D.: *Epidemiologic Studies of Asian Influenza in a Louisiana Parish*, *Am. J. Hyg.*, 70:251-271, 1959.

Figure 6. INFLUENZA ATTACK RATES BY AGE  
TANGIPAHOA PARISH, LOUISIANA  
AUGUST 1957

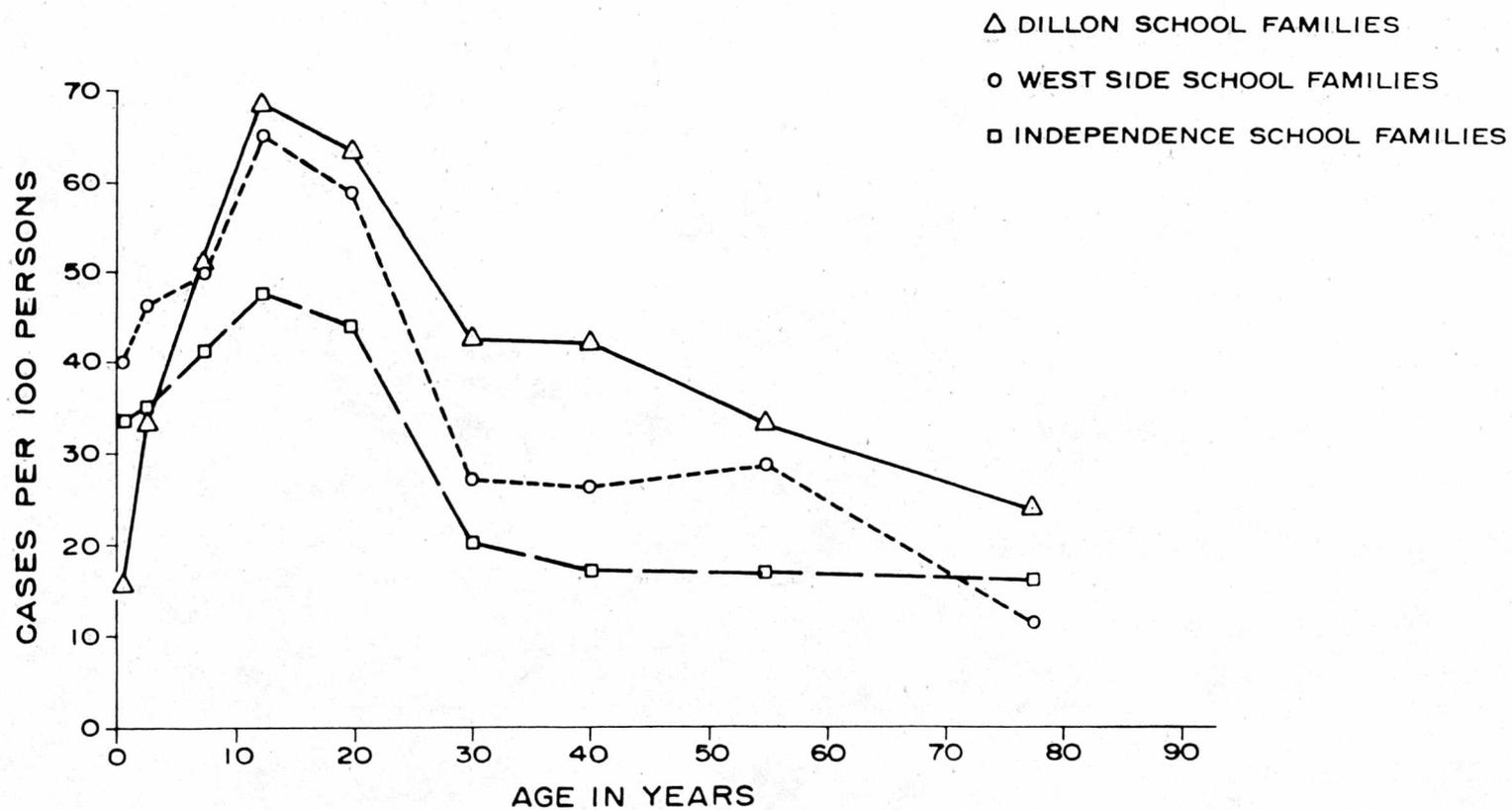


Figure 7. INFLUENZA ATTACK RATES BY AGE, SCHOOL SURVEY, KANSAS CITY, MISSOURI

A study similar to that presented in Figure 6 was done in a high school in Kansas City, Missouri, following an epidemic there. A questionnaire was issued to high school students and taken home for completion. A total of 1,355 questionnaires were returned, constituting 63 percent of those issued. These yielded a study population of 5,733 individuals, with an average of 4.2 persons per family.

The overall attack rate, including students and their families, was 34 per 100 persons. Highest attack rates were observed in the 10- to 19-year age group, a finding similar to that in the preceding figure.

REFERENCES

Chin, T. D. Y., Foley, J. F., Doto, I. L., Gravelle, C. R., and Weston, J.: *Observations on Morbidity and Mortality Characteristics of Asian Influenza*, Pub. Health Rep., 75:149-158, 1960.

Figure 7. INFLUENZA ATTACK RATES BY AGE, KANSAS CITY, MISSOURI  
OCTOBER 1957

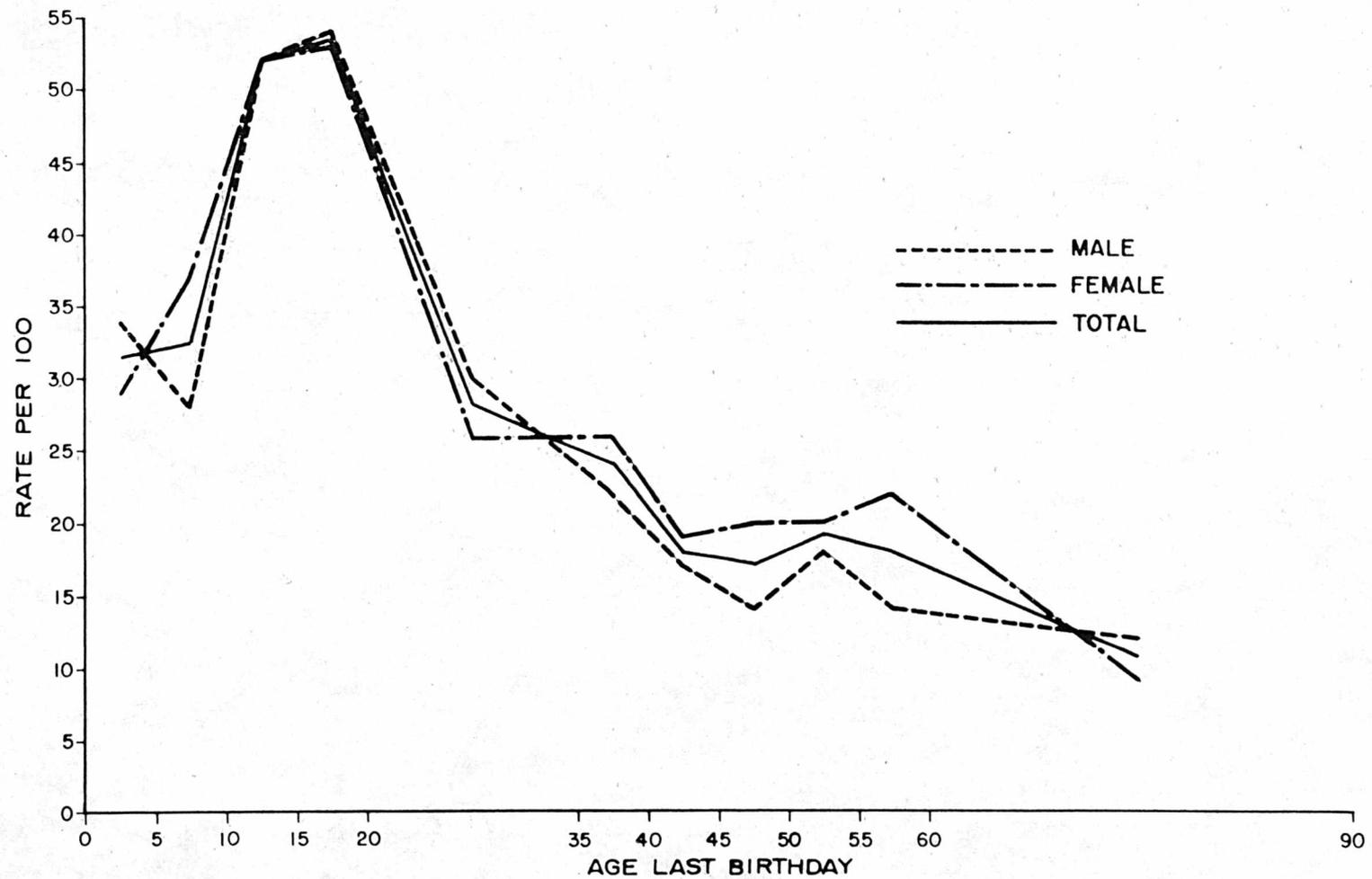


Figure 8. MONTHLY PNEUMONIA – INFLUENZA MORTALITY AND  
RESPIRATORY DISEASE MORBIDITY – 1956-1959

Influenza and pneumonia trends are detected by analysis of information from a variety of sources. The three trend lines based on data from four sources reflect the same trend and, except for minor fluctuations, are remarkably similar.

The first graph shows the total number of deaths due to influenza and pneumonia recorded by the National Office of Vital Statistics in 1956-1957; and the number estimated monthly (1956-September 1958) from the 10 percent sample of death certificates maintained by the NOVS. (There is an eighteen-month lag in the availability of final figures on mortality in the United States; and a three- to four-month lag for data from the 10 percent sample.)

The second graph is a trend line constructed from the number of influenza and pneumonia deaths reported weekly by 108 cities in the United States. (These data are immediately available during the winter months by telegraph to the NOVS.)

The third graph is based on the number of new cases of respiratory illness, (involving one or more days of disability or a visit to a physician) collected through the National Health Survey. During the epidemic of 1957-1958, these data were available on a weekly basis. They are cumulated here on a monthly basis.

These trend lines show the salient characteristics of the epidemic, namely: 1) maximum number of respiratory illnesses in October; 2) maximum number of deaths recorded a month later; 3) a "second wave" of increased mortality during January, February, and March with little, if any, evidence of abnormal incidence of respiratory illnesses.

Figure 8. MONTHLY PNEUMONIA - INFLUENZA MORTALITY  
AND RESPIRATORY DISEASE MORBIDITY - 1956-1959

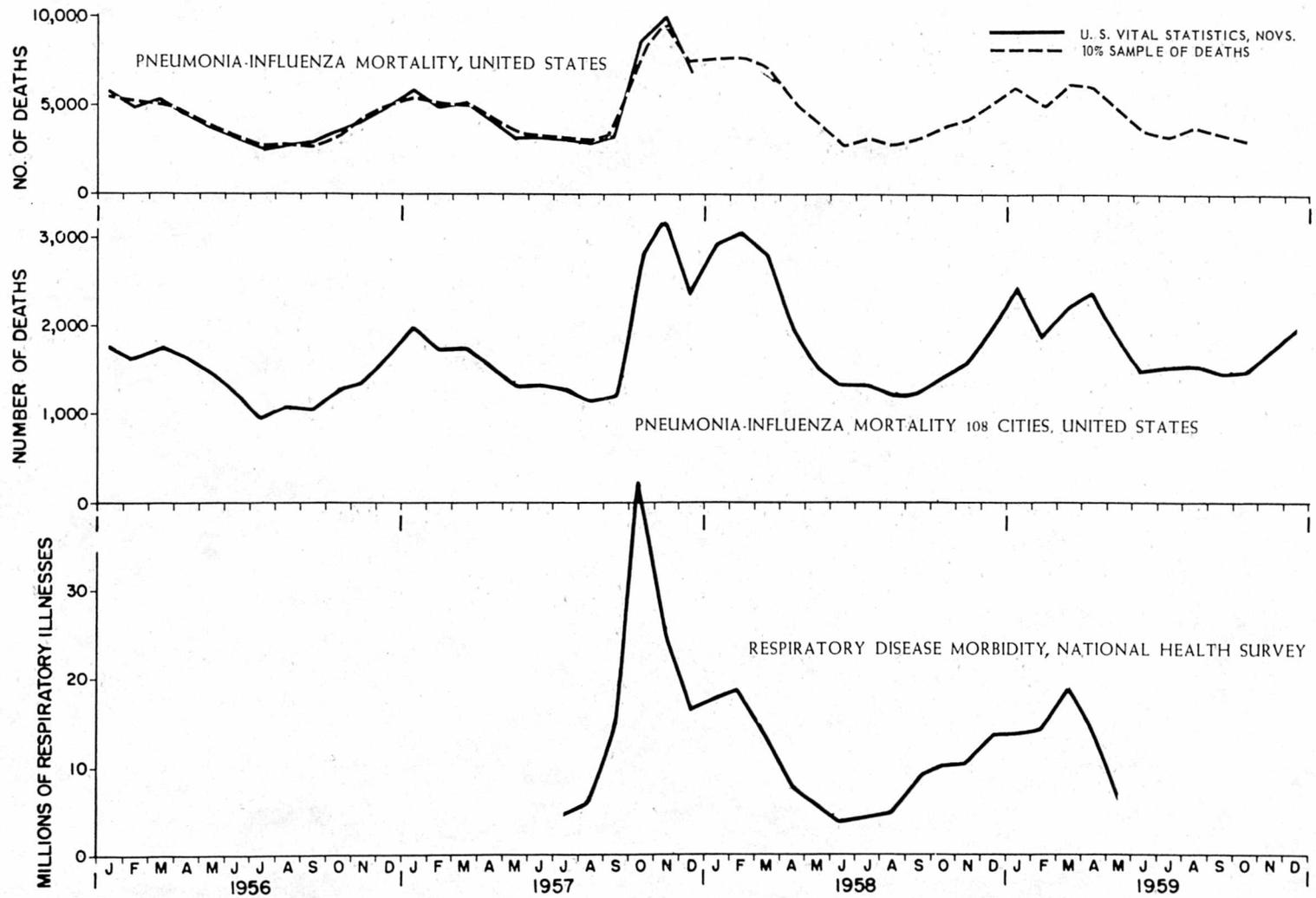


Figure 9. MORBIDITY AND MORTALITY PEAKS, ASIAN INFLUENZA, UNITED STATES - 1957

This graph illustrates the temporal relationships of morbidity and mortality from Asian influenza in the United States, as compiled from four sources.

**1. County Reporting:** This measurement consists primarily of data received from State Health Officers and Epidemiologists. It was supplemented in many instances by information received from Epidemic Intelligence Service Officers, the National Office of Vital Statistics, and newspaper accounts of the first recognition of sharp outbreaks in specific counties.

**2. National Health Survey:** In its first year of operation, the National Health Survey was able to organize a regular collecting system, on a nationwide sample basis, of the number of new cases of respiratory disease with one or more days in bed.

**3. Industrial Absenteeism:** Through the kind cooperation of Dr. L. Holland Whitney, Medical Director of the American Telephone and Telegraph Company, industrial absenteeism data on approximately 60,000 telephone employees in 36 major cities across the

nation were made available from early October through the remainder of the epidemic.

**4. Excess Influenza and Pneumonia Mortality:** Influenza and pneumonia mortality data from the routine weekly telegraphic reports of 108 United States cities, with a total population of 50,000,000, were made available from the National Office of Vital Statistics. These data were then analyzed by the Communicable Disease Center's Statistics Section, using a modification of the procedure devised by Dr. Selwyn D. Collins.

To facilitate comparison of temporal relationships, each index is presented in terms of the total frequency during the 8-week period included in the chart.

It will be noted that there is remarkable agreement among the 3 morbidity indices, and that they rise and fall essentially in parallel. There is a 2- to 3-week lag in mortality. This is a reflection, in part, of inherent delay in reporting, the duration of the disease in the patient, and the later time of infection in the older and debilitated individual.

#### REFERENCES

- Perrott, G. St. J., and Linder, E. F.: *Data on Acute Upper Respiratory Diseases*, U. S. National Health Survey, Pub. Health Rep., 73:121-128, 1958.
- Trotter, Y., Jr., Dunn, F. L., Drachman, R. H., Henderson, D. A., Pizzi, M., and Langmuir, A. D.: *Asian Influenza in the United States, 1957-1958*, Am. J. Hyg., 70:34-50, 1959.

Figure 9. MORBIDITY AND MORTALITY PEAKS, ASIAN INFLUENZA, UNITED STATES - 1957

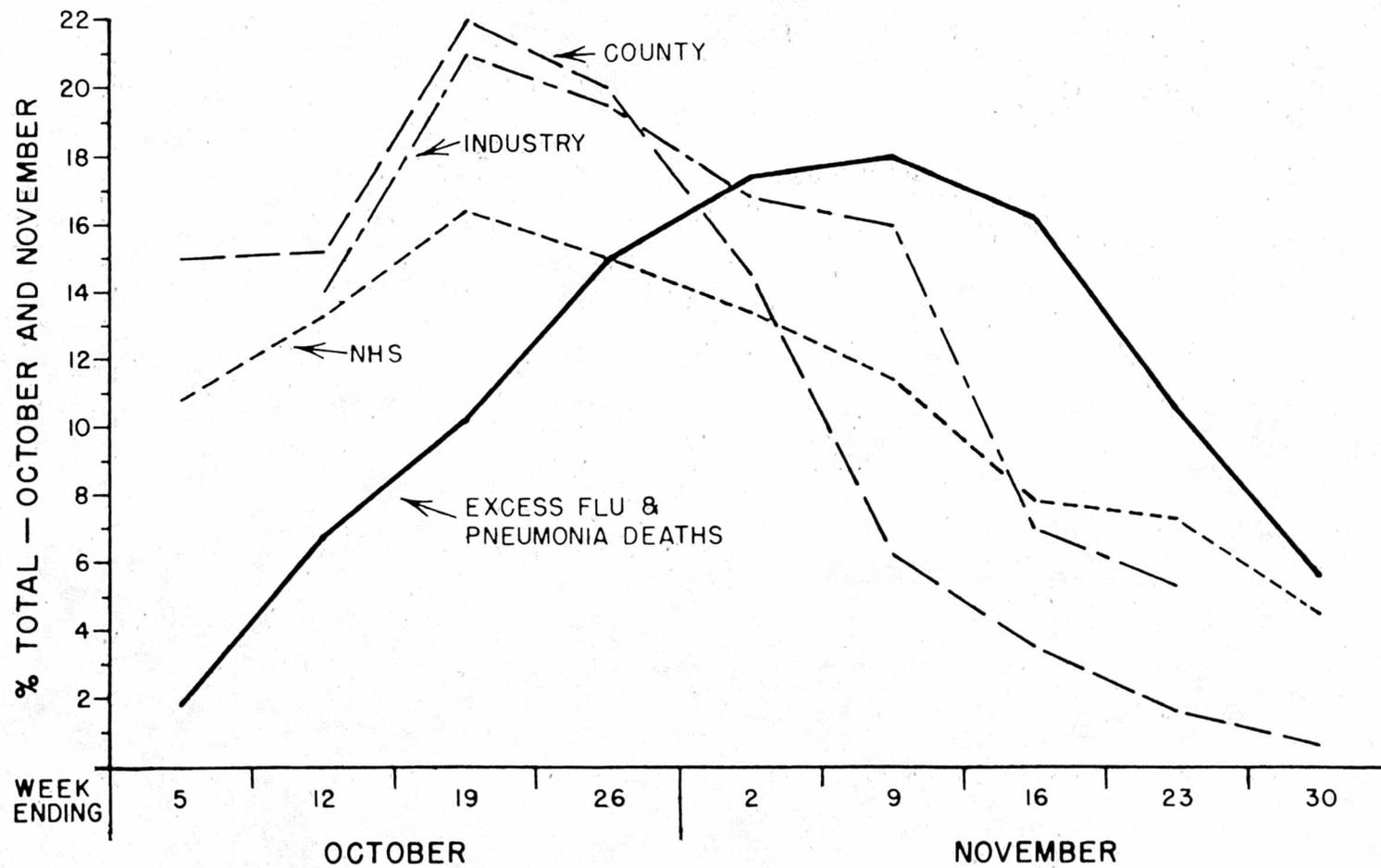


Figure 10. INFLUENZA AND PNEUMONIA DEATHS BY BROAD AGE GROUPS,  
UNITED STATES - 1956-57

In the pre-epidemic year of 1956, the seasonal distribution of deaths by broad age groups had a similar pattern for all ages: high in the winter months, decreasing to a low in June and July, slowly rising in August, and gathering momentum in October for the peak months of December and January. In 1957 this pattern was greatly changed by the Asian influenza epidemic.

In the age groups under 45, pneumonia - influenza deaths reached a peak in October except for infants under one year of age. In the infants, deaths increased steadily through December.

Among persons 45 years of age and older the number of pneumonia - influenza deaths reached a peak in November and decreased in December.

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Source of Data: Special tabulations prepared by the National Office of Vital Statistics on number of pneumonia-influenza deaths, excluding pneumonia of the newborn.

Figure 10. INFLUENZA AND PNEUMONIA DEATHS  
 BY BROAD AGE GROUPS  
 UNITED STATES, 1956-1957

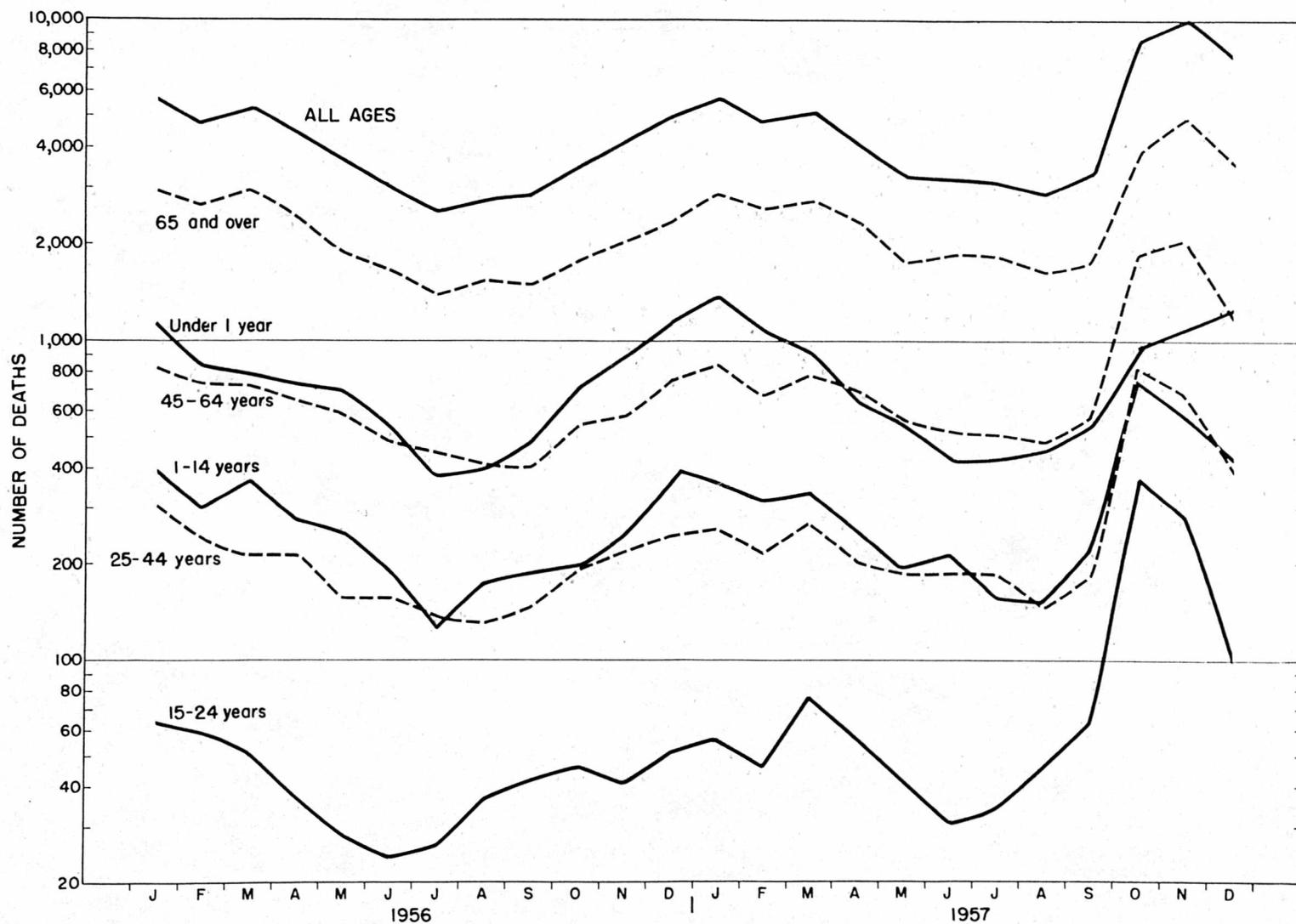


Figure 11. INFLUENZA AND PNEUMONIA DEATHS BY AGE GROUPS  
UNDER 25, UNITED STATES - 1956-57

Pneumonia - influenza deaths among the younger age population in 1956 followed the usual pattern of a rise in the fall, culminating in a maximum in the winter months of December and January.

In 1957 the pattern for all the younger age groups was essentially the same as in earlier years prior to the Asian influenza outbreak in the fall. Then, marked differences appear in the force of mortality by age.

Among infants the 1957 pattern was the same as in 1956 - rising to a maximum in December. The pre-school age group (1-4), in contrast to the 1956 pattern, reached maximum levels in October-November and decreased somewhat in December.

The school age and young adult groups showed sharp increases, with a peak in October, decreasing somewhat in November, and falling off sharply in December.

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Source of Data: Special tabulations prepared by the National Office of Vital Statistics on number of pneumonia-influenza deaths, excluding pneumonia of the newborn.

Figure 11. INFLUENZA AND PNEUMONIA DEATHS BY AGE GROUPS UNDER 25  
 UNITED STATES - 1956-57

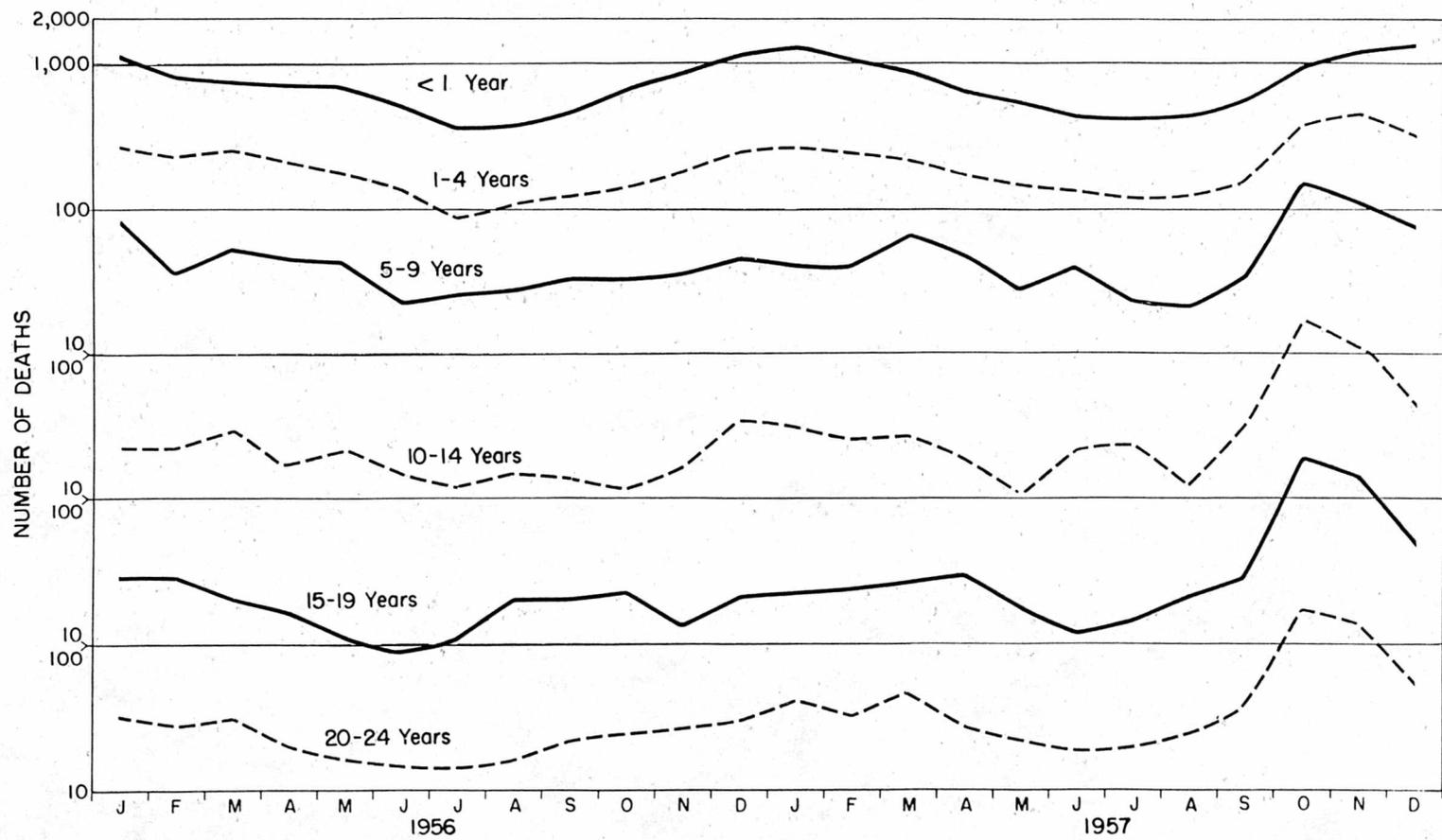


Figure 12. PNEUMONIA AND INFLUENZA MORTALITY BY AGE IN CERTAIN  
EPIDEMIC YEARS, ANNUAL RATES BY AGE

This figure shows pneumonia - influenza mortality rates by age in certain U. S. epidemics of the last 70 years.

Note the extremely high mortality rates, the "W" shape of the age-specific rate curve in 1918, and the absence of similar features in the other epidemic years. The marked decline in pneumonia - influenza mortality is apparent.

Rates for 1892, 1918, and 1936 were taken from a paper of Selwyn D. Collins published in Public Health Reports, July 20 and July 27, 1945, pp. 821-835 and 853-863. Rates for 1957 were taken from the Special Report Series, National Summaries, Vol. 50, No. 5, April 24, 1959, of the National Office of Vital Statistics.

Figure 12. PNEUMONIA AND INFLUENZA MORTALITY  
BY AGE IN CERTAIN EPIDEMIC YEARS

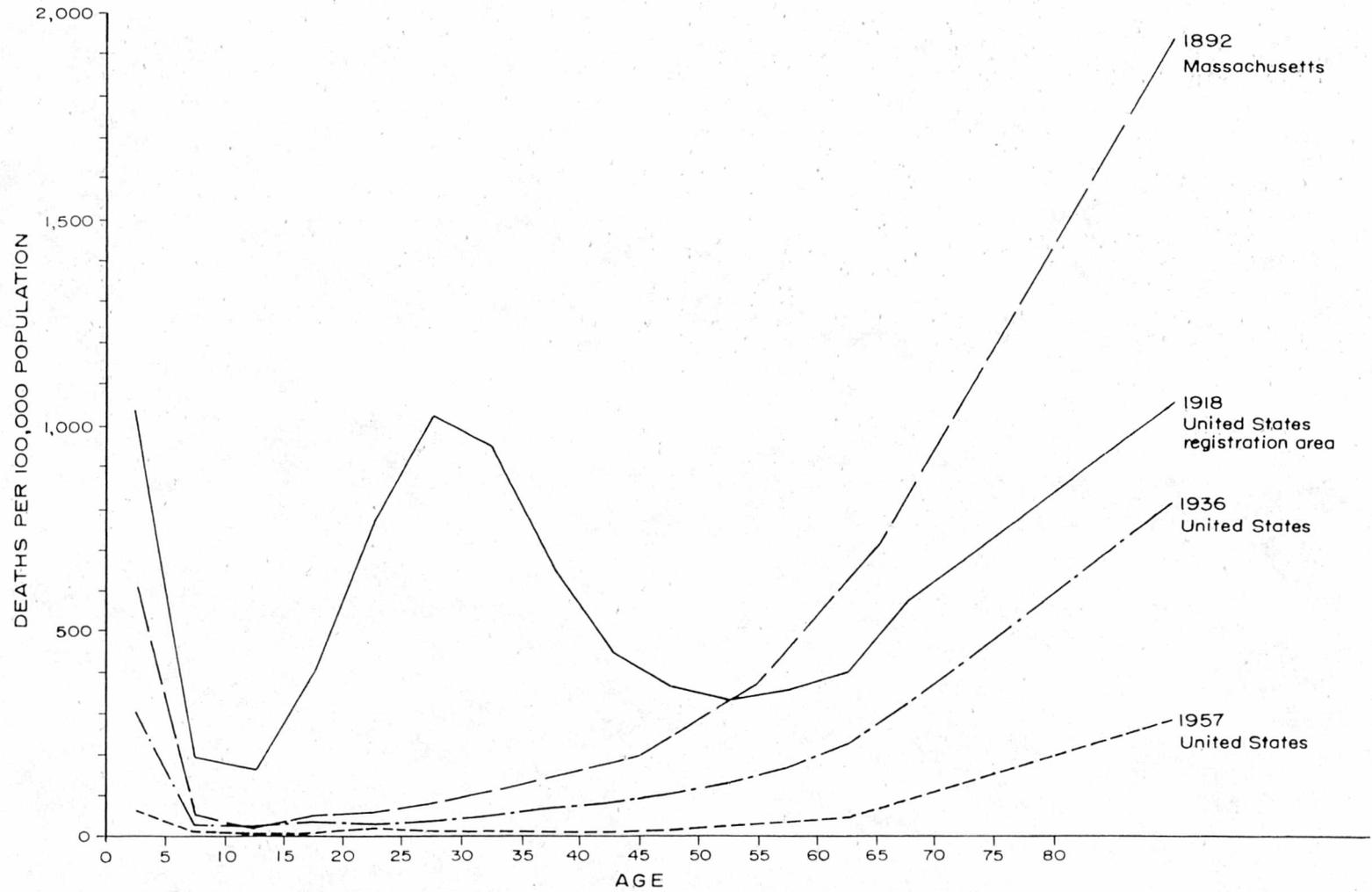


Figure 13. INFLUENZA AND PNEUMONIA MORTALITY RATES IN THE UNITED STATES BY AGE - OCTOBER-MARCH 1956-57 AND 1957-58.

This figure demonstrates that the curve of mortality rates due to influenza and pneumonia by age which was recorded during the 1957-58 epidemic is in the shape of a letter "U", with high mortality rates at either end of the age spectrum. This "U"-shaped curve of mortality rates by age has characterized influenza epidemics since 1920, and was not altered as a result of the introduction of the Asian strain of influenza. There was an increase in mortality rates due to influenza and pneumonia in all age groups in 1957-58 as compared to 1956-57, but no deviation from the usual age curve can be found.

Before the epidemic of Asian influenza began in the fall of 1957, fears were expressed that the introduction of the new strain might result in a relatively high mortality in young adults such as characterized the 1918-19 pandemic (Figure 12). The "W"-shaped age-specific mortality rate curve recorded in 1918-19 has, however, remained a unique and unexplained occurrence.

Figure 13. INFLUENZA AND PNEUMONIA MORTALITY RATES IN THE UNITED STATES  
BY AGE - OCTOBER - MARCH, 1956-57 AND 1957-58

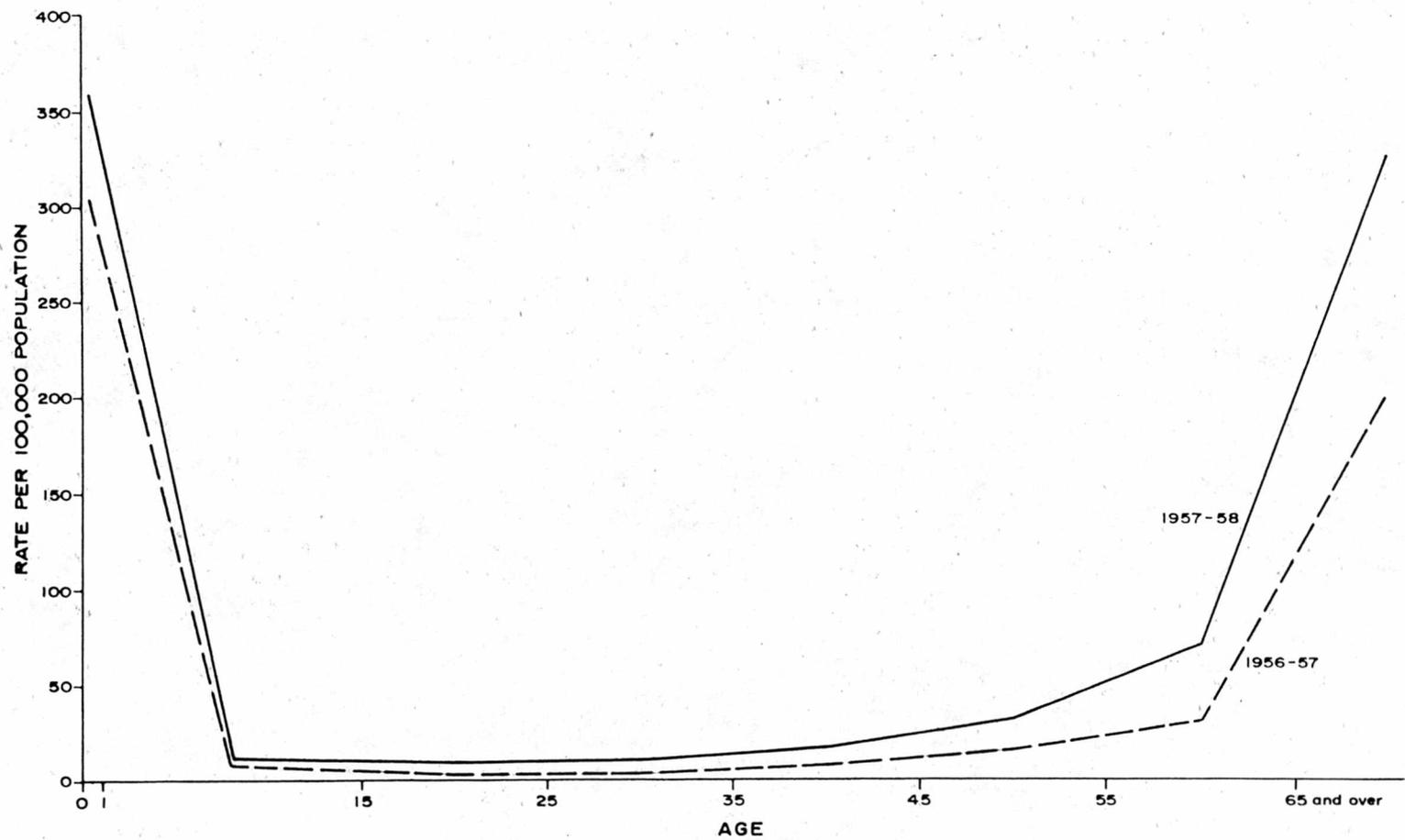


Figure 14. MORTALITY FROM INFLUENZA AND PNEUMONIA FOR SELECTED YEARS IN THE UNITED STATES

As shown in Figure 14, the pneumonia and influenza death rates in the 1957-58 epidemic in the United States were not excessively high when compared with the same rates for certain other recent epidemics. The peak of mortality in the 1953 epidemic was reached in February with a death rate from influenza and pneumonia of 75.9 per 100,000 population. In the 1951 epidemic, the mortality peak occurred in March with a rate of 59.8 per 100,000 population. The mortality experience in the 1957-58 epidemics was slightly different, consisting of two broader and longer peak periods which extended over a period of approximately six months. The highest point in the 1957-58 epidemic occurred in November when the influenza-pneumonia mortality rate was 66.6 per 100,000 population. It should be recognized, however, that the normal seasonal levels of influenza-pneumonia mortality rates are significantly lower in the autumn months (October - December) than in the winter months (January - March).

REFERENCE

Dauer, C. C.: *Mortality in the 1957-58 Influenza Epidemic*, Pub. Health Rep., 73:803-810, 1958.

Figure 14. MORTALITY FROM INFLUENZA AND PNEUMONIA FOR SELECTED YEARS  
IN THE UNITED STATES

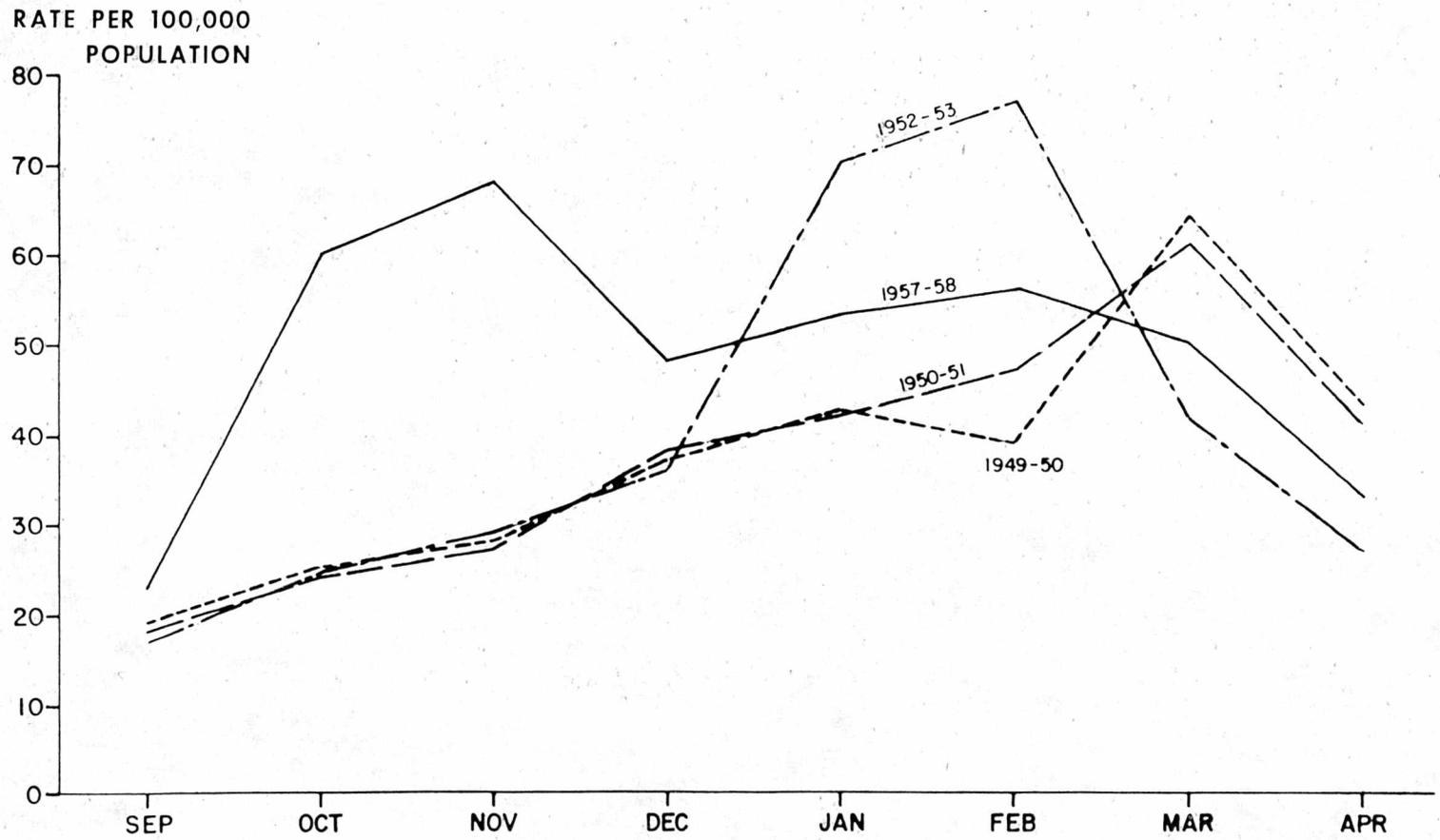


Figure 15. WEEKLY INFLUENZA AND PNEUMONIA DEATHS IN ENGLAND  
AND THE UNITED STATES - 1957-58

This figure illustrates the similarity between the English and American experiences in the epidemic of Asian influenza in 1957-58. The English data represent the experience in 160 Great Towns which contain the bulk of the urban population of England and Wales. The mortality data from the United States similarly reflect an urban population, the residents of 108 major cities, comprising approximately 34 percent of the population of this country. It will be noted that the Asian influenza epidemics as measured by mortality due to influenza and pneumonia peaked in England about four weeks before those in the United States. The marked parallelism in the shape of the curves, including the unique second wave in the early months of 1958, is evident.

Figure 15. WEEKLY INFLUENZA AND PNEUMONIA DEATHS  
IN ENGLAND AND THE UNITED STATES - 1957-58

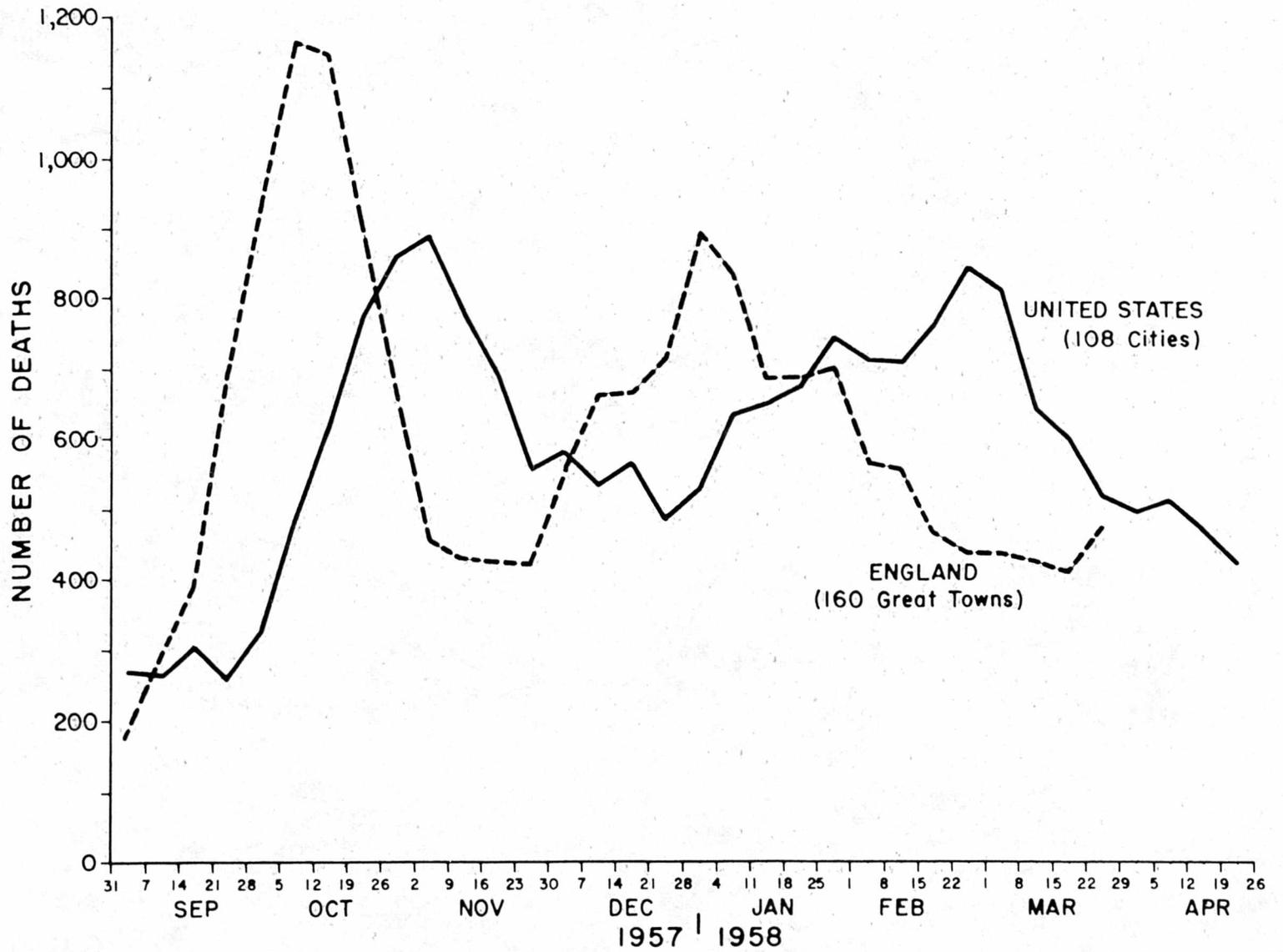


Figure 16. EXCESS ANNUAL DEATH RATE IN MASSACHUSETTS AND REPRESENTATIVE U. S. CITIES - 1887-1957

Dr. Selwyn Collins, in the publication referred to below, made the following comments concerning this figure.

"The earliest records now available for any State in the United States are deaths by months from influenza and pneumonia in Massachusetts. These monthly excess death rates (annual basis) are shown in the two top sections of figure 16 for the years 1887 to 1910, inclusive, during which time 12 small and moderate-sized outbreaks occurred; the larger ones include those with peaks in January 1890, December-January 1891-92, January 1899, and March 1900.

"Figure 16 also shows influenza and pneumonia excess death rates, by months, in a group of 35 large cities in the United States from January 1910 through August 1918, during which period three epidemics occurred with peaks in January 1916, January 1917, and April 1918. Beginning with September 1918, data for the same group of 35 cities are shown by weeks to the end

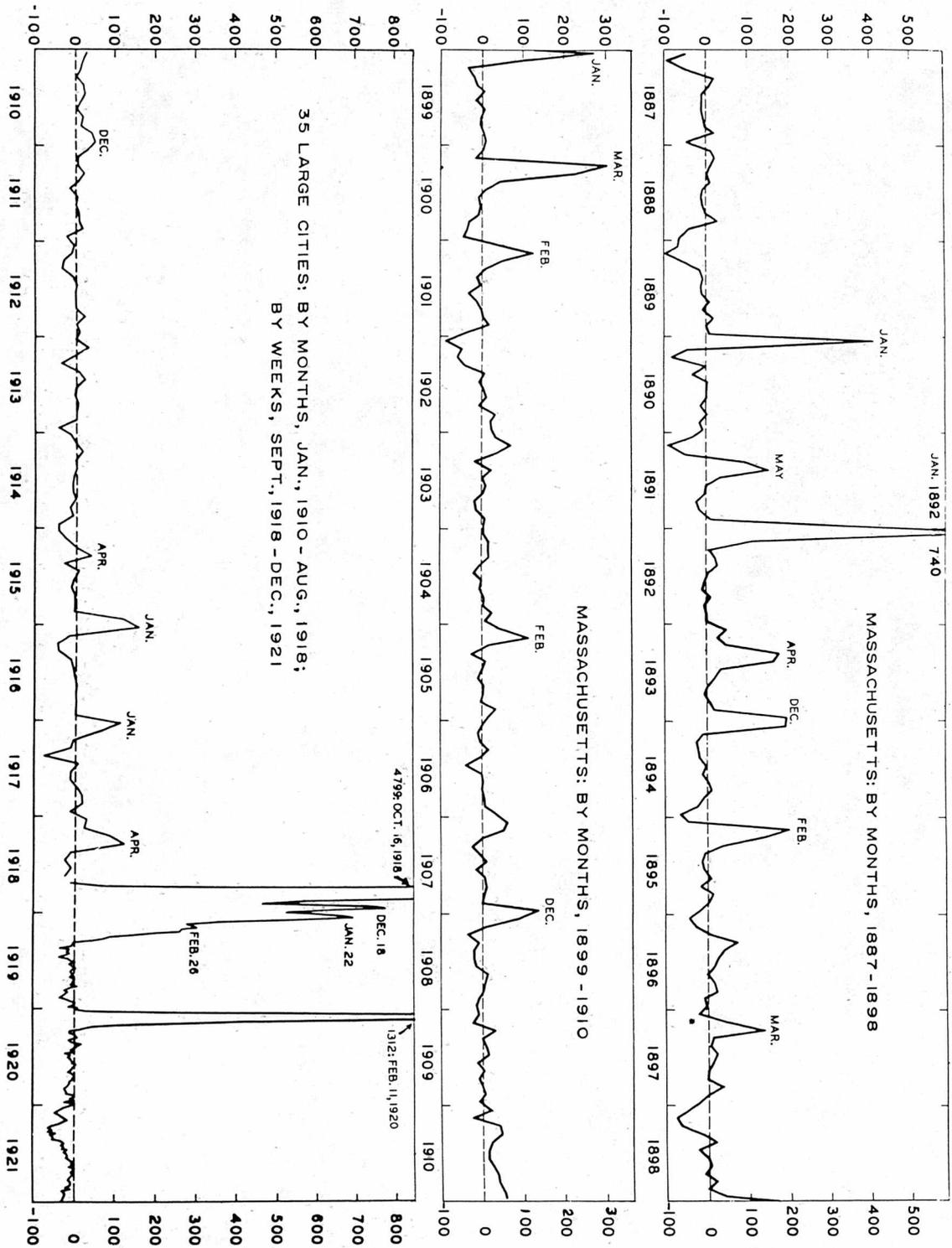
of 1921. Starting with January 1922, the record is continued by weeks for a group of 90 representative cities to the end of 1942, after which time the data are shown by weeks for a group of 56 large cities to the end of 1950, at which time six cities were added to make 62 cities carried until early in 1956.

"This figure shows the high fall peak of the great pandemic, which occurred in October 1918 and January 1919, respectively. These latter peaks are higher than any peak of influenza mortality that has occurred since that time, except the peak of 1920.

"During the 70 years represented in figure 16, 1887 to 1956, inclusive, there were 41 epidemics. These ranged in size from three which showed excess deaths in only a few geographic sections, with no measurable excess for the total of all sections of the United States, to the pandemic of 1918-19, which was excessively severe in all sections but less severe in some than in others."

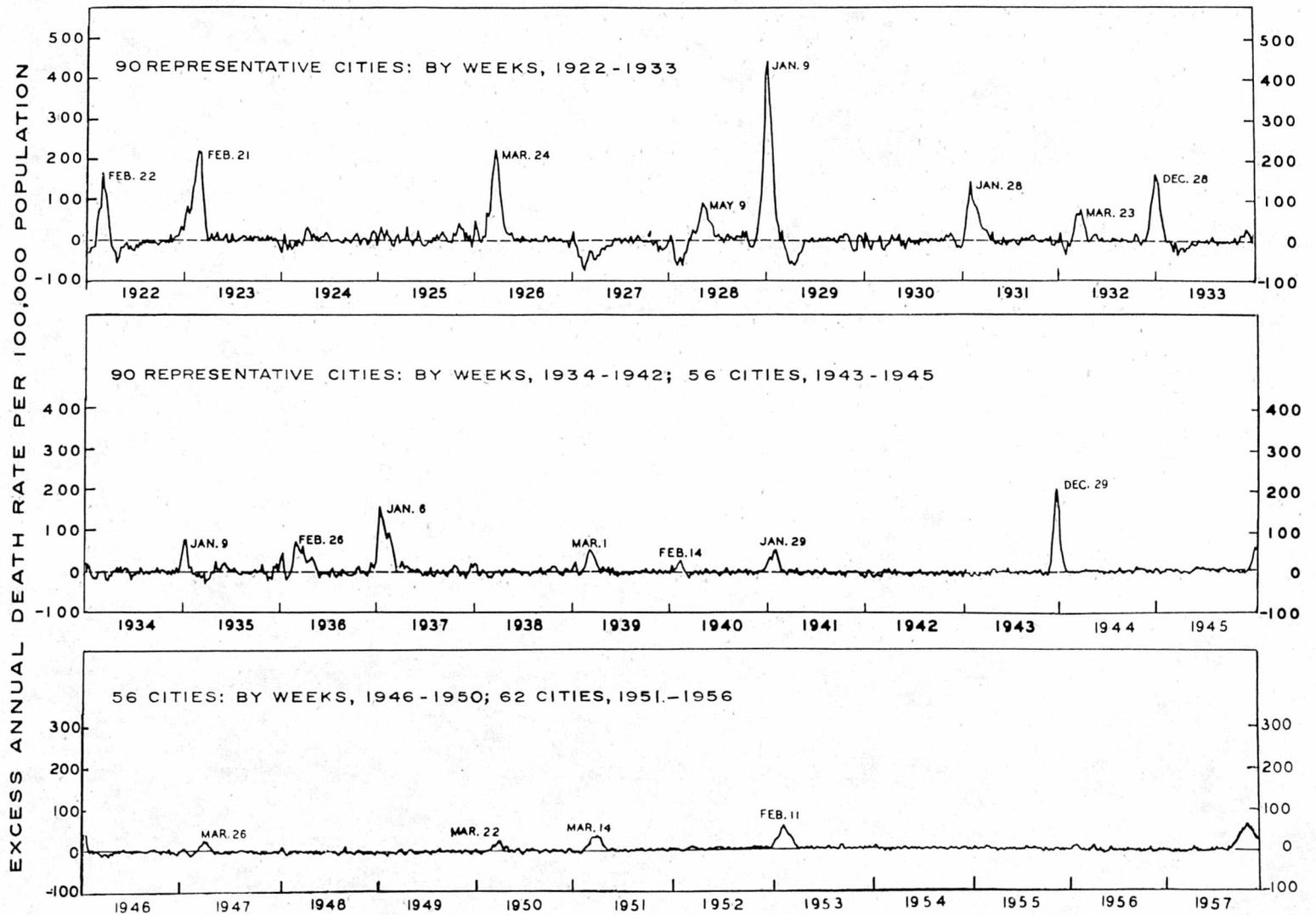
Source: Collins, S. D.: *Trend and Age Variation of Mortality and Morbidity from Influenza and Pneumonia*. In: Public Health Monograph No. 48, U. S. Government Printing Office, Washington, D. C., 1957.

EXCESS ANNUAL DEATH RATE PER 100,000 POPULATION



From Collins, Public Health Monograph No. 48

Figure 16 EXCESS ANNUAL DEATH RATE IN MASSACHUSETTS AND IN REPRESENTATIVE UNITED STATES CITIES - 1887-1957



From Collins, Public Health Monograph No. 48

Figure 17. EXCESS PNEUMONIA AND INFLUENZA MORTALITY IN U. S. CITIES - 1956-60

This figure shows relative excess pneumonia-influenza mortality in the United States during the period 1956-60. The excess (or deficiency) is the percentage deviation above or below expected mortality in each week.

The dotted line during the first three months of 1956 was calculated from tables of Selwyn D. Collins\* showing excess mortality as rates. These percentages were based on reports from 56 cities.

The solid line represents the percentage excess calculated from the number of excess deaths based on the procedure of R. E. Serfling described in the text facing figure 18 of this series. These data are based on reports from 108 cities.

The influenza epidemics of 1957-58 and 1960 are well-defined.

\*Collins, Selwyn D.: *Influenza Epidemics During 1951-56 With a Review of Trends*, Pub. Health Rep., 72:771-780, 1957.

Figure 17 EXCESS PNEUMONIA AND INFLUENZA MORTALITY IN U.S. CITIES, 1956-60

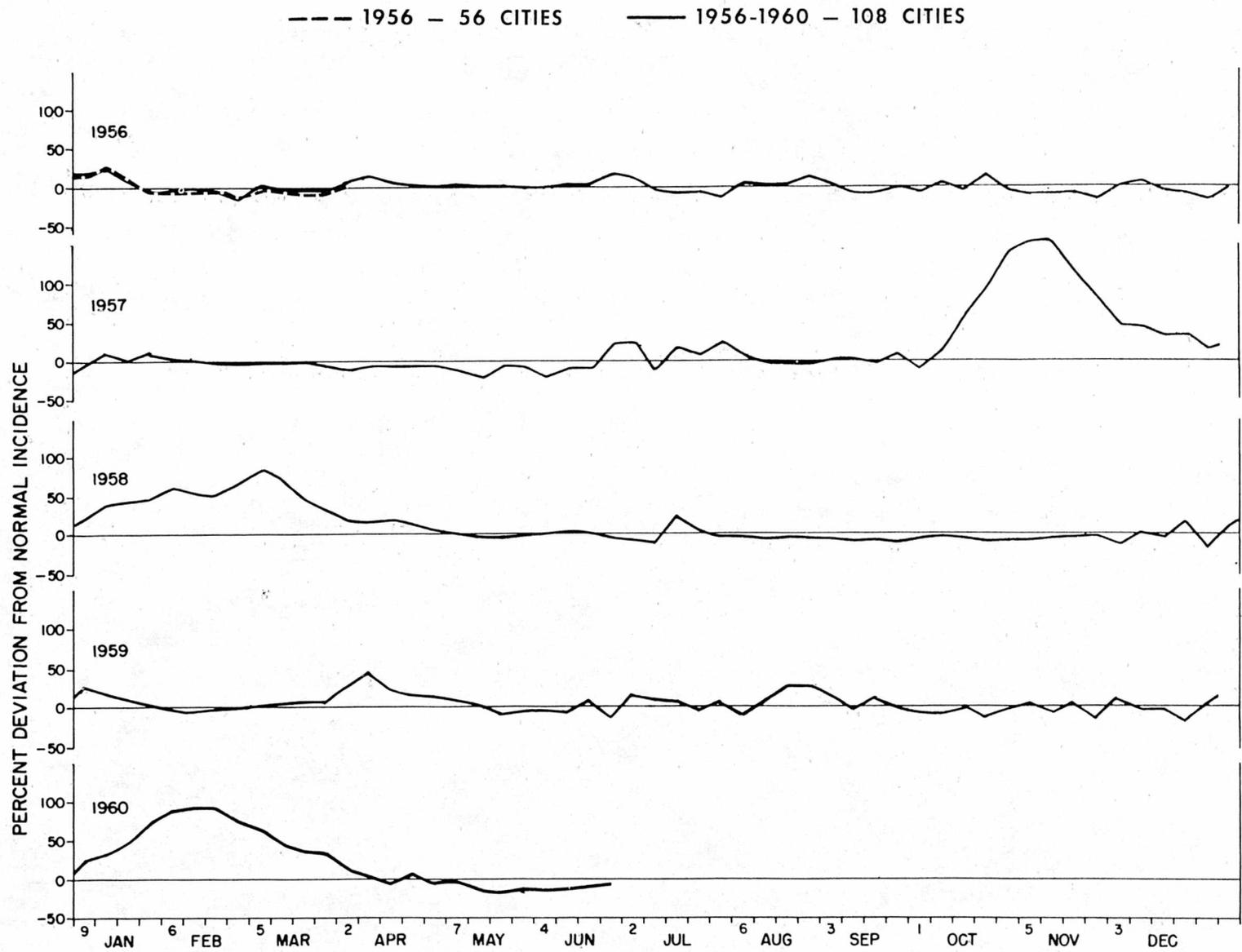


Figure 18. WEEKLY PNEUMONIA

Pneumonia and influenza deaths reported weekly to the National Office of Vital Statistics by registrars of 108 cities are shown in this figure for the United States and nine geographic divisions. (See map)

The numbers of deaths reported each week are shown as small circles connected by straight lines. The solid, smoothly curved line defines an average seasonal expectancy determined from recorded data for the period September through August of 1955-56, 56-57, and 58-59. The epidemic year 1957-58 was not included in the calculations. The parameters of the equation:

$$y = 300.5 + 2.135 t + 97.55 \cos \left( \frac{2 \pi t}{13} - 2.6744 \right)$$

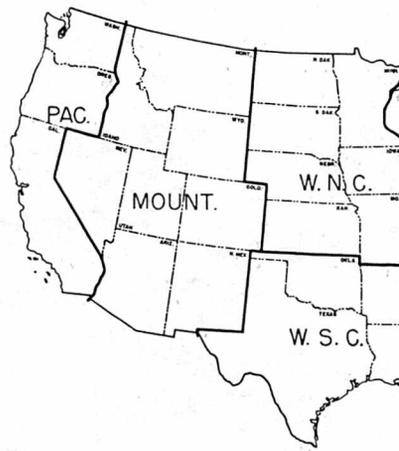
which defines the expected number of deaths in the total of 108 cities were determined by least squares. In this equation  $y$  represents the expected number of deaths in a given week. The unit of time,  $t$ , is a four-week period. The origin,  $t = 0$ , is at the mid-point of the four-week period ending September 24, 1955. The 1959-60 portion of the curve is an extrapolation. The dashed line "epidemic threshold" is at a distance of 1.65 standard deviations above the trend line. The standard deviation is

## AND INFLUENZA DEATHS -- 1957-1960

adjusted for the linear extrapolation, but not for within year variations in the standard deviation of the Fourier term.

The linear trend indicated by the term  $2.135 t$  indicates that the average weekly number of deaths in the 108 cities is increasing at a rate of 2.135 deaths per four-week period. This increase is somewhat greater than the population increase and reflects a small annual increase in the number of pneumonia-influenza deaths reported in these cities in recent years.

In addition to the two Asian epidemic waves in 1957-58, a slight excess mortality is shown nationally in the late winter and spring of 1958-59. This was related to the prevalence of both influenza A<sub>2</sub> and B. The epidemic of January through March 1960 is quite evident. It is of interest that both the Mountain and Pacific divisions, with only mild excess mortality in 1957 and essentially no second wave of mortality in 1958, had marked waves of excess mortality in 1960. Furthermore, the Middle Atlantic division, extensively involved in the outbreak in the spring of 1959, had only a minor degree of excess mortality in 1960.



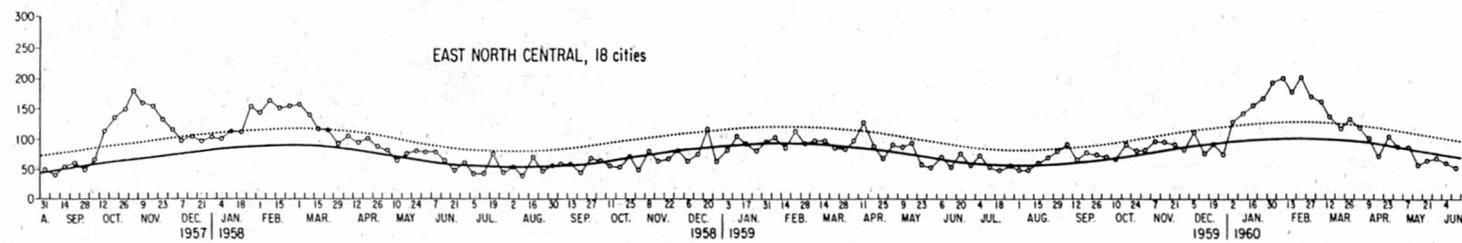
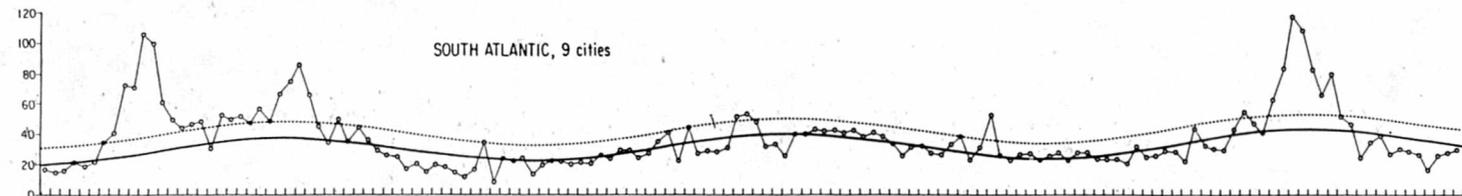
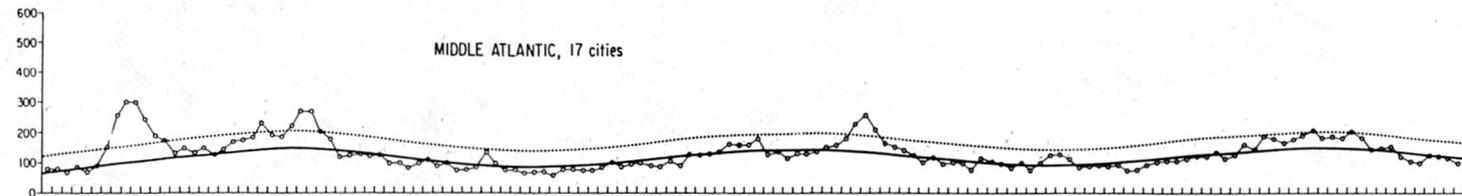
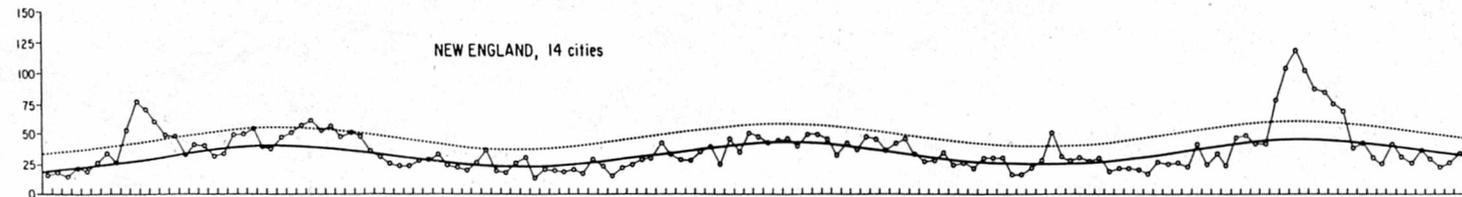
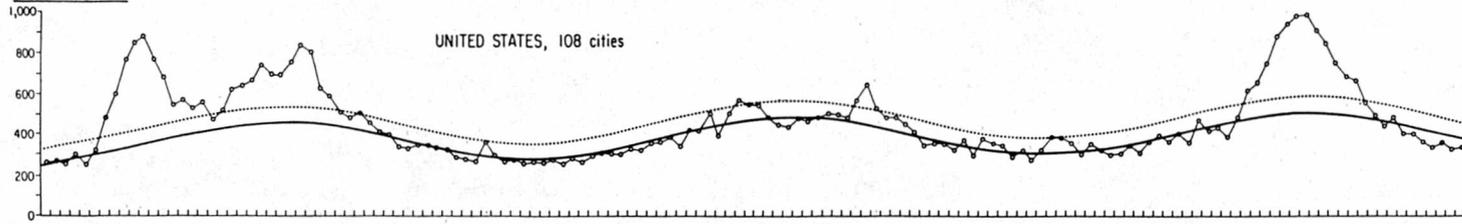
# LEGEND for Figure 18



----- EPIDEMIC THRESHOLD

————— NORMAL INCIDENCE

NUMBER OF DEATHS



A. SEP. OCT. NOV. DEC. | JAN. FEB. MAR. APR. MAY JUN. JUL. AUG. SEP. OCT. NOV. DEC. | JAN. FEB. MAR. APR. MAY JUN.  
1957 | 1958 1959 | 1960

Figure 18. WEEKLY PNEUMONIA AND INFLUENZA DEATHS  
1957 - 1960

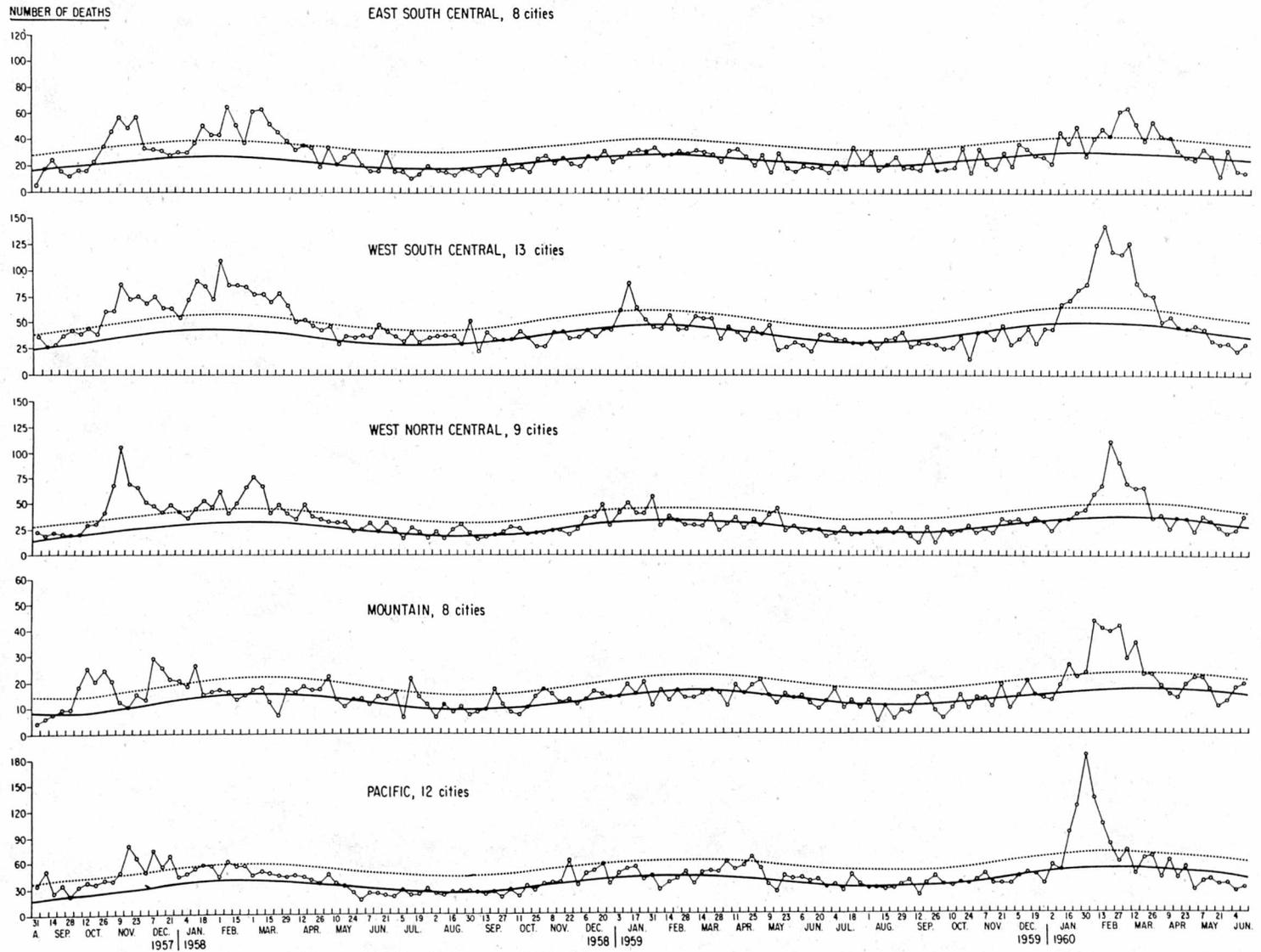


Figure 19. EXCESS PNEUMONIA AND INFLUENZA MORTALITY BY AGE,  
UNITED STATES - OCTOBER-DECEMBER 1957 AND JANUARY-  
MARCH 1958

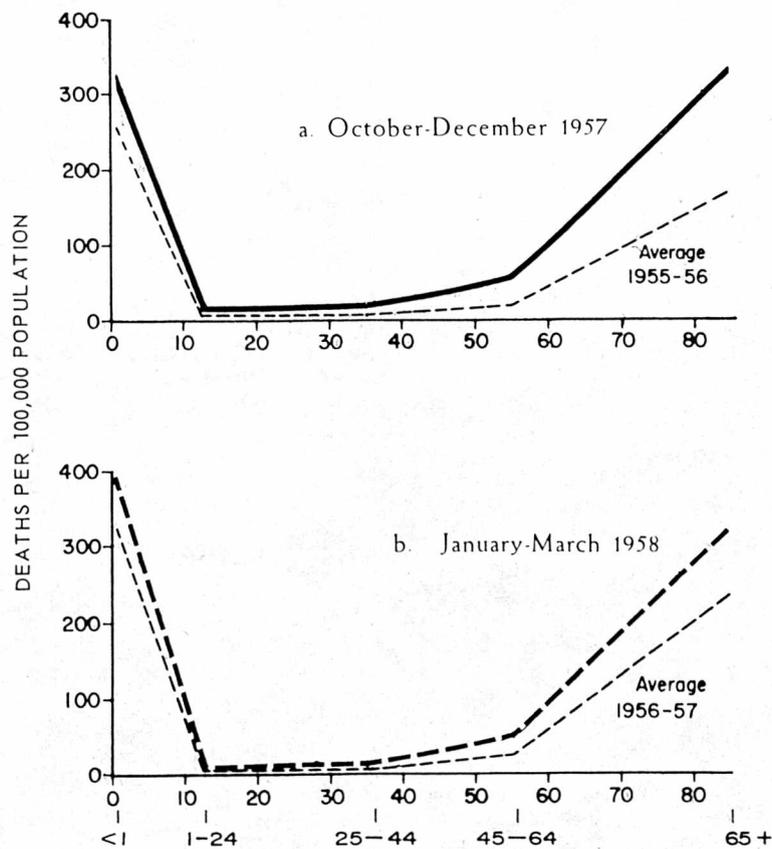
This figure presents excess pneumonia-influenza mortality by comparison of death rates during the 1957-58 epidemic with the corresponding period in 1957-58 when mortality was at normal levels.

It may be observed that, although age-specific mortality rates were of approximately the same magnitude during the two waves of the epidemic, the excess mortality rate was greater during the first wave. This results from the fact that the expected death rate in January through March is normally higher than in October through December.

Part c of this figure shows the relative excess mortality by age in the two phases of the epidemic. Note that the absolute increase in mortality is greatest in the older age groups but the greatest relative increase occurred in the ages 25 to 44.

Data are from a monthly 10 percent sample of U. S. deaths taken by the National Office of Vital Statistics.

Figure 19. EXCESS PNEUMONIA AND INFLUENZA MORTALITY BY AGE  
 UNITED STATES - OCTOBER-DECEMBER 1957 AND JANUARY-MARCH 1958



\*10% CURRENT MORTALITY SAMPLE, NATIONAL OFFICE OF VITAL STATISTICS.

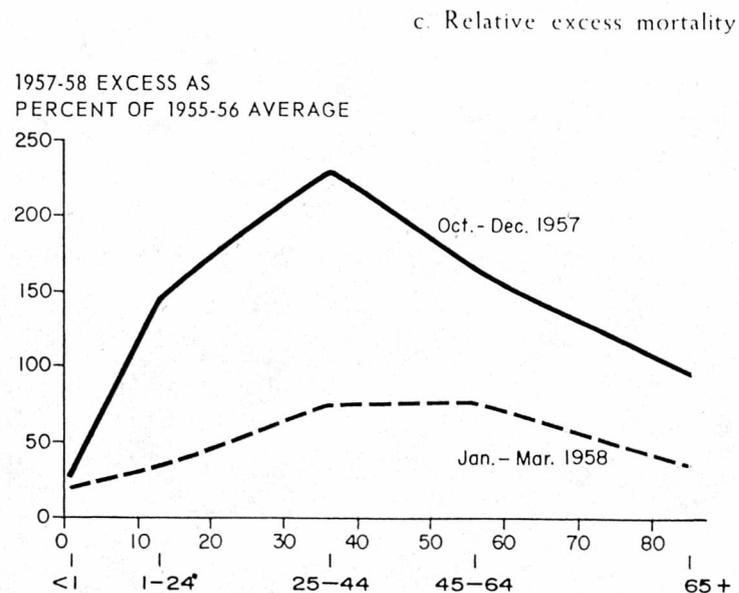


Figure 20. PERCENT OF TOTAL EXCESS DEATHS DUE TO INFLUENZA  
AND PNEUMONIA DURING SELECTED EPIDEMIC PERIODS

This figure, constructed from the data of Dr. Selwyn D. Collins,\* demonstrates the percent of total excess mortality which was credited to influenza and pneumonia during each of the epidemic prevalences of influenza in the United States from 1918 to 1956. Thus, it can be seen that in the pandemic of 1918-19, influenza-pneumonia was recorded as the primary cause of death in 92 percent of the total excess deaths. In the years since that pandemic there has been a gradual decline in the percentage of excess deaths credited to influenza and pneumonia. Conversely, a gradually increasing percentage of excess deaths has been credited to other causes, particularly cardiovascular-renal diseases. One of the probable factors in this change is the increasing proportion of older persons in the population in whom degenerative diseases are commonly found.

\*Collins, S. D.: *Trend in Age Variation of Mortality and Morbidity from Influenza and Pneumonia*. In: Public Health Monograph No. 48, U. S. Government Printing Office, Washington, D. C., 1957.

Figure 20 PERCENT OF TOTAL EXCESS DEATHS DUE TO  
INFLUENZA AND PNEUMONIA DURING SELECTED EPIDEMIC PERIODS

From Collins, Public Health Monograph No. 48

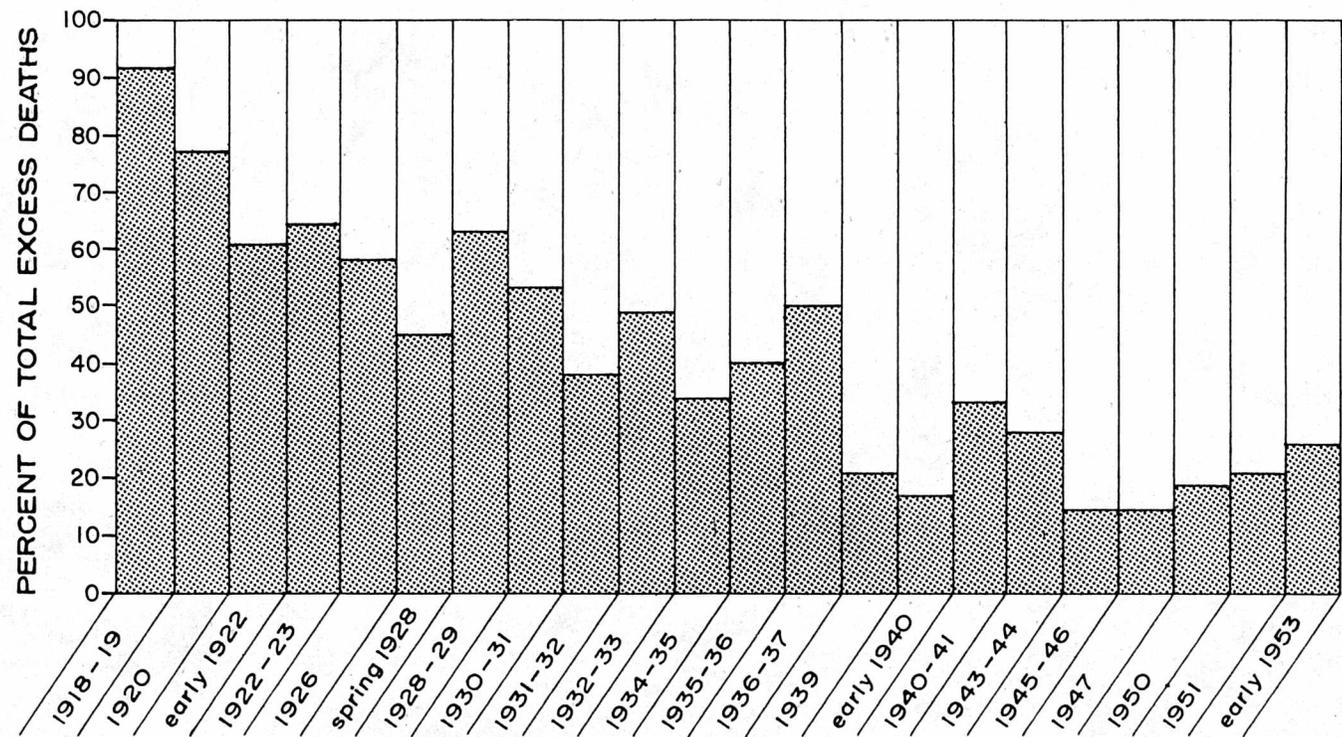


TABLE I

ESTIMATED EXCESS MORTALITY BY AGE AND SELECTED CAUSES, UNITED STATES  
1957-58 AND 1960

Age Group	1957 Oct-Dec	1958 Jan-Mar	1960 Jan-Mar
Under 1	600	200	-3,200*
1-14	1,300	100	100
15-24	1,000	300	200
25-44	3,600	700	2,200
45-64	10,400	5,300	6,100
65 and over	22,400	13,400	21,300
All Ages	39,300	20,000	26,700
Selected Causes			
Pneumonia-Influenza	12,100	6,000	10,600
Cardiovascular-renal	18,700	13,000	12,200
All other causes	8,500	1,000	3,900
All Causes	39,300	20,000	26,700

\* The infant mortality rate in January 1960 was the lowest rate ever recorded for January.  
Monthly Vital Statistics Report 9(3)2, May 18, 1960.

Source of Data: Serfling, R. E., Communicable Disease Center, 1960  
Calculations based on mortality data from the National Office of Vital Statistics.

TABLE II

INFLUENZA AND PNEUMONIA MORTALITY RATES PER 100,000 POPULATION IN SPECIFIED COUNTRIES,  
1956 AND 1957, AND PERCENTAGE INCREASE IN MORTALITY FROM 1956 TO 1957

	1956	1957	Percent Increase
AFRICA			
Mauritius	58.3	106.3	82.3
Rhodesia	25.3	24.9	- 1.5
THE AMERICAS			
Canada	35.9	43.1	20.0
United States	27.0	35.8	32.6
Costa Rica	56.2	94.7	68.5
Guatemala	211.1	276.2	30.8
Trinidad	52.7	69.1	31.3
British Guiana	60.5	65.7	8.5
Colombia	93.1	110.6	18.8
ASIA			
Taiwan	86.1	108.3	26.0
Hong Kong	146.3	150.6	2.9
Japan	34.0	51.6	51.7
Portuguese India	65.4	77.9	19.1
Israel	25.5	29.6	16.0
EUROPE			
England and Wales	56.0	65.8	17.5
Scotland	42.3	52.9	25.0
Finland	32.9	73.6	123.7
Austria	56.7	73.7	30.0
France	60.0	73.1	21.8
Hungary	74.0	90.5	20.3
Ireland	47.0	58.8	25.1
North Ireland	48.0	62.1	29.4
Luxembourg	47.4	61.4	29.5
Netherlands	29.4	30.2	2.7
Portugal	99.2	99.7	.5
Malta	31.2	23.6	- 24.3
Iceland	47.0	58.8	25.1
OCEANIA			
Australia	34.9	38.3	9.7

Source: Demographic Yearbook, Statistical Office of the United Nations, New York.

## ACKNOWLEDGEMENTS

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Mrs. Ida L. Sherman, Assistant Chief, Statistics Section

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